

THE LOWER MERRIMACK RIVER VALLEY

**AN INVENTORY OF
HISTORIC ENGINEERING
AND INDUSTRIAL SITES**



**MERRIMACK VALLEY TEXTILE MUSEUM
AND
HISTORIC AMERICAN ENGINEERING RECORD**

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HISTORIC ENGINEERING
AND INDUSTRIAL SITES**

**SPONSORED BY
MERRIMACK VALLEY
TEXTILE MUSEUM
NORTH ANDOVER, MASSACHUSETTS
AND
HISTORIC AMERICAN
ENGINEERING RECORD
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INTRODUCTION

I. The HAER Inventory: Purposes and Scope

During the summer of 1975 the Director of the Merrimack Valley Textile Museum, Thomas W. Leavitt, and the Chief Historian of the Historic American Engineering Record, T. Allan Comp, agreed to conduct an inventory of the industrial archaeology of the lower Merrimack Valley, from North Chelmsford to Newburyport. The Museum agreed to provide the services of its curator and administrative staff, as well as its research facilities, while the Historic American Engineering Record provided data of past surveys, inventory cards, maps, and related materials. HAER also agreed to publish the results of the inventory. A large part of the impetus for the project was supplied by Dr. Patrick Malone, Director of the Slater Mill Historic Site in Pawtucket, Rhode Island, whose staff was conducting a similar inventory in the Rhode Island area.

Previous to this inventory, a number of the more important industrial structures of the lower Merrimack Valley had been surveyed with varying degrees of thoroughness. In 1968 the Historic American Building Survey competently inventoried several textile mills in Lawrence, and a few other structures, such as the Middlesex Canal and the North Canal at Lawrence, have been placed on the National Register of Historic Sites by various organizations. During the years 1974-1975, a HAER team conducted an excellent survey of the water power system at Lowell, exclusive of the Wamesit Canal. I have made use of thirty inventory cards of the Lowell canal system which were prepared by Charles Hyde and Charles Parrott, who were members of this HAER team. Finally, a number of brief surveys have been made by the State of Massachusetts and the Historic American Engineering Record of a few additional industrial structures in the Valley.

The purpose of this inventory is to create a reference of all remaining industrial structures in the lower Merrimack Valley which were built prior to 1930. To as great an extent as possible, each inventory card contains a brief history of the structure concerned, a description of the site, and a listing of those reference materials which proved most helpful in the survey of that particular site.

Because of space limitations in this book, only the cards of the most important sites have been reproduced in full. Less important sites are listed, but their descriptions have been abridged. Complete descriptions are on file at the Historic American Engineering Record. An additional feature has been added to this inventory. Those structures of historic significance which have been destroyed are also listed, to prevent wasted efforts by researchers in determining whether they are still in existence.

II. The Cities and Towns of the Lower Merrimack Valley

During the nineteenth and early twentieth centuries the lower Merrimack Valley ranked as one of the half dozen most industrialized areas in the United States. The most important reason for this concentration of industry was the Merrimack River and its system of tributaries. The Merrimack falls about ninety feet during the forty miles from the Pawtucket Dam at Lowell to the Newburyport light at the mouth of the river. The river supplies an average of about 6,000 cubic feet per second of water at Lowell and slightly more at Lawrence, and is capable of providing a steady flow of water during the dryest months of the year. The topography of the river is also such that it can be ponded into reservoirs of considerable size, and its rocky bed and high banks provide solid anchorages for dams. Until the 1820s, however, the size and power of the Merrimack were too formidable for the limited engineering capabilities of colonial and early national Americans; only the shipbuilders of Haverhill, Amesbury, Salisbury, and Newburyport could take advantage of the Merrimack's flow to provide them with timber from New Hampshire, port facilities for their imported building materials, and a deep channel in which to launch their ships and boats. It was along the tributaries of the Merrimack where the first industries arose.

Stony Brook, which runs northeasterly for seven and one-half miles from Forge Village, in the town of Westford, through Graniteville, West Chelmsford, and North Chelmsford, empties into the Merrimack two miles above Lowell. Dammed in seven places, it powered grist mills, forges, blast furnaces, and fulling mills from the seventeenth century onward.

Beaver Brook, with its headwaters in southern New Hampshire, flows almost due south and empties into the Merrimack opposite Lowell. It, too, was the site of fulling and grist mills, as well as early woolen and cotton mills in the town of Dracut.

The Concord River is the largest of the Merrimack's lower tributaries, and it flows northward about fifteen miles from its headwaters in Concord, joining the Merrimack at Lowell. The Concord was the principal source of water for the Middlesex Canal, which drew its water from the millpond at North Billerica. The Wamesit Canal, the oldest power canal in New England, also drew its water from the Concord.

The Spicket River begins in southern New Hampshire and enters the Merrimack at Lawrence. Its most important fall was in the town of Methuen, where it provided the power for saw, grist and fulling mills as well as a cotton mill in the years before 1820.

The Shawsheen River begins in Lexington, flows through Andover, and empties into the Merrimack a mile and one-half below the Lawrence dam, after a run of nineteen miles. It, too, was the site of small grist, saw and textile mills

in the town of Andover from the seventeenth century onward.

Cochichewick Brook, only one and one-half miles long from its source at Great Pond to the Merrimack, was the site of five dams and several mills in the years before 1830, as it flowed through North Andover.

The Little River, beginning in New Hampshire, joins the Merrimack at Haverhill and provided power for a cotton mill as early as 1804.

The last of the tributaries is the Powow River, which begins in New Hampshire and flows southward to the Merrimack through the town of Amesbury. Falling seventy-five feet within a space of some one hundred yards in Amesbury, the Powow was the site of many saw and grist mills, as well as Jacob Perkins's nail factory (1800) and an 1812 woolen mill owned by Paul Moody and Ezra Worthen, two of the builders of Lowell.

By 1820 the lower Merrimack Valley, with its textile, shipbuilding, and ironmaking industries, was as heavily industrialized as any other section in the United States, but its most important development was yet to come; this was the introduction of the nation's first mill town, Lowell. Boston capitalists who had met with great success in the manufacture of cotton print cloth and sheetings in Waltham, on the Charles River, determined to build a complex of cotton mills, taking advantage of the vast water power of the Merrimack at Pawtucket Falls, near the beginning of the Middlesex Canal. Using a transportation canal around Pawtucket Falls as a feeder, the developers of Lowell built a series of power canals between the years 1822 and 1847 which developed an average of 10,000 horsepower. The Middlesex Canal was used as a shipping route to Boston, and by 1835 a railroad had been opened between Lowell and Boston. Success was complete. Lowell continued to expand its textile industry and textile machinery industry throughout most of the nineteenth century, turning to steam power in the years after 1860 to supplement the water of the canals.

So successful was the Lowell experiment that the owners of that city's mills and canal system determined to build a second factory town on the Merrimack. The city of Lawrence, almost eleven miles downstream from Lowell, was financed, designed and built by the organizers of Lowell. Since the fall at Lawrence was less than five feet, it was necessary to construct a very high dam. It was completed in 1848 and remains almost unchanged. It is the most impressive of the industrial structures in the lower Merrimack Valley. By 1860 Lawrence contained almost as many spindles as Lowell, but Lawrence did not develop completely until the years after 1880. Between 1880 and 1920 Lawrence became the largest worsted producer in the world, with the huge steam powered mills of the Pacific, Arlington and American Woolen Company. Lawrence also became an important center for the manufacture of paper and paper making machinery.

The textile industry expanded in the smaller towns along the tributaries of the Merrimack as well as in Lowell and Lawrence in the years 1820-1920. Forge Village, Graniteville, North Chelmsford, Dracut, North Billerica, Andover, North Andover, Methuen, and Amesbury all became the sites of dozens of woolen mills. Because of the diverse nature of their products, early woolen mills were not large operations. Since their sizes were limited, their power requirements were also relatively modest, and were usually satisfied by the mill privileges which were located in the small towns of the Merrimack Valley. The rental fees for these small mill privileges were also much cheaper than those of the water power companies in Lowell and Lawrence. Newburyport was the only small town in the lower Merrimack Valley where cotton mills could be found, and the three steam mills of this town could not match the sizes of those in Lowell and Lawrence.

The dominance of the textile industry in the lower Merrimack Valley was seriously challenged by only one other manufacture: that of shoes. In Haverhill especially, and to a lesser extent in Amesbury and Newburyport, dozens of shoe manufacturers, as well as such related industries as tanning and heel making, were flourishing as early as 1860. Until the 1890s most of the shoe factories were small, employing less than fifty workers each and using only handpowered tools and machinery. After 1890 shoe manufacturers began to build mills on similar lines to those of the textile industry.

The only other industries of importance were machinery and carriage making. The machine shops and foundries of Gay and Silver in North Chelmsford, Lowell, Kitson and Atherton in Lowell, Sargent in Graniteville, Davis and Furber in North Andover, and the Lawrence Machine Shop, manufactured not only textile machinery but locomotives, steam engines, boilers, water turbines, and machine tools. The carriage industry, on the other hand, was located only in Amesbury, where upward of two dozen factories, powered by steam, manufactured thousands of carriages per year.

The twentieth century was not a prosperous time for the industries of the lower Merrimack Valley. The cotton industry had begun to move to the South as early as 1880, and this trend gathered momentum as the twentieth century progressed. Lowell, as a cotton manufacturing center, was most seriously affected by the trend. By the 1930s the cotton industry in Lowell was practically nonexistent, with only the worsted and woolen industries continuing operations. These latter industries, too, began to move to the South in the years after 1920. During the two decades which followed the end of World War II, ninety-five per cent of the woolen-worsted industry moved to the South.

As the textile industry moved out of the area, such related industries as the textile machinery makers, bobbin and spindle makers, wool scourers and cotton bleachers also suspended operations or moved. Today the textile mills of Lowell, Lawrence and the other textile towns of the lower Merrimack Valley are

occupied by a wide variety of small industries or by warehouses.

The shoe industry, always unstable, went into a decline during the 1930s from which it has never recovered. Although some shoe factories continue to operate in Haverhill, the industry is in serious decline. The shoe industry disappeared from Amesbury and Newburyport during the 1930s.

In Amesbury the carriage builders converted their shops into automobile body factories after 1900, enjoying considerable success until the 1920s, when the competition from the auto body makers of the midwest became too intense. The automobile industry disappeared from Amesbury after 1930, with the exception of one firm which survived as a manufacturer of window channels.

The lack of economic development since the 1950s is a major reason for the survival of so many of the nineteenth and early twentieth century mill buildings and hydraulic power sites. Their greatest enemies have been not the modernization programs of industry but the efforts of urban "renewal" advocates, many of whom view mill sites as potential parking lots.

Several of the highway and railroad bridges over the Merrimack River date from the nineteenth century. The Aiken Street Bridge in Lowell is a superb example of a lenticular truss. Another highway bridge, at Lawrence, is a graceful, double intersection Warren Truss. At Newburyport is the only suspension bridge in Massachusetts. This bridge, dating from 1909, replaced an 1810 suspension bridge which had been designed by James Finley. A number of stone and reinforced concrete arched bridges survive, most notably the Western Canal bridge at Lowell (1830) and the Boston and Acton Railroad bridge at Graniteville (1848). Two Moseley truss canal bridges from the 1860s also survive in Lawrence.

III. Format of the Inventory

The industrial architecture of this inventory has been organized into HAER categories by town. The towns are listed alphabetically. For the most important sites, the HAER inventory cards have been reproduced without deletion. Space limitations have made it necessary to provide only abstracts for the inventory cards of less important sites. The complete cards are available at the Historic American Engineering Record, together with sketch-maps of the sites and photographs. Following the list of inventoried sites is a list of the locations and nature of those well known industrial structures which are no longer in existence. The most important references for each site are listed in parentheses.

Peter M. Molloy
February, 1976

IV. Abbreviations of Most Common References

William R. Bagnall, The Textile Industries of the United States (Cambridge, MA, 1893) [Bagnall]

William R. Bagnall, "The Textile Industries of the United States," vol. II, MSS copy at Merrimack Valley Textile Museum [Bagnall MSS]

Barlow Insurance Surveys. Merrimack Valley Textile Museum [Barlow]

Contributions of Old Residents. (Lowell, 1880-1925) [COR]

Factory Mutual Insurance Surveys. Merrimack Valley Textile Museum [FM]

Frank P. Hill, Lowell Illustrated (Lowell, 1884) [Hill]

D. Hamilton Hurd, comp., History of Essex County (Phila., 1887), 2 vols. [HHEC]

D. Hamilton Hurd, comp., History of Middlesex County (Phila., 1890), 2 vols. [HHMC]

Lowell Today, (Lowell, 1893) [Lowell Today]

Lowell Mail Souvenir (Lowell, 1890) [Souvenir]

Patrick M. Malone, Water Power in Lowell, Massachusetts (Washington, 1974) [Malone]

J. W. Meader, The Merrimack River (Boston, 1871) [Meader]

Manuscript collections of Merrimack Valley Textile Museum [MSS-MVTM]

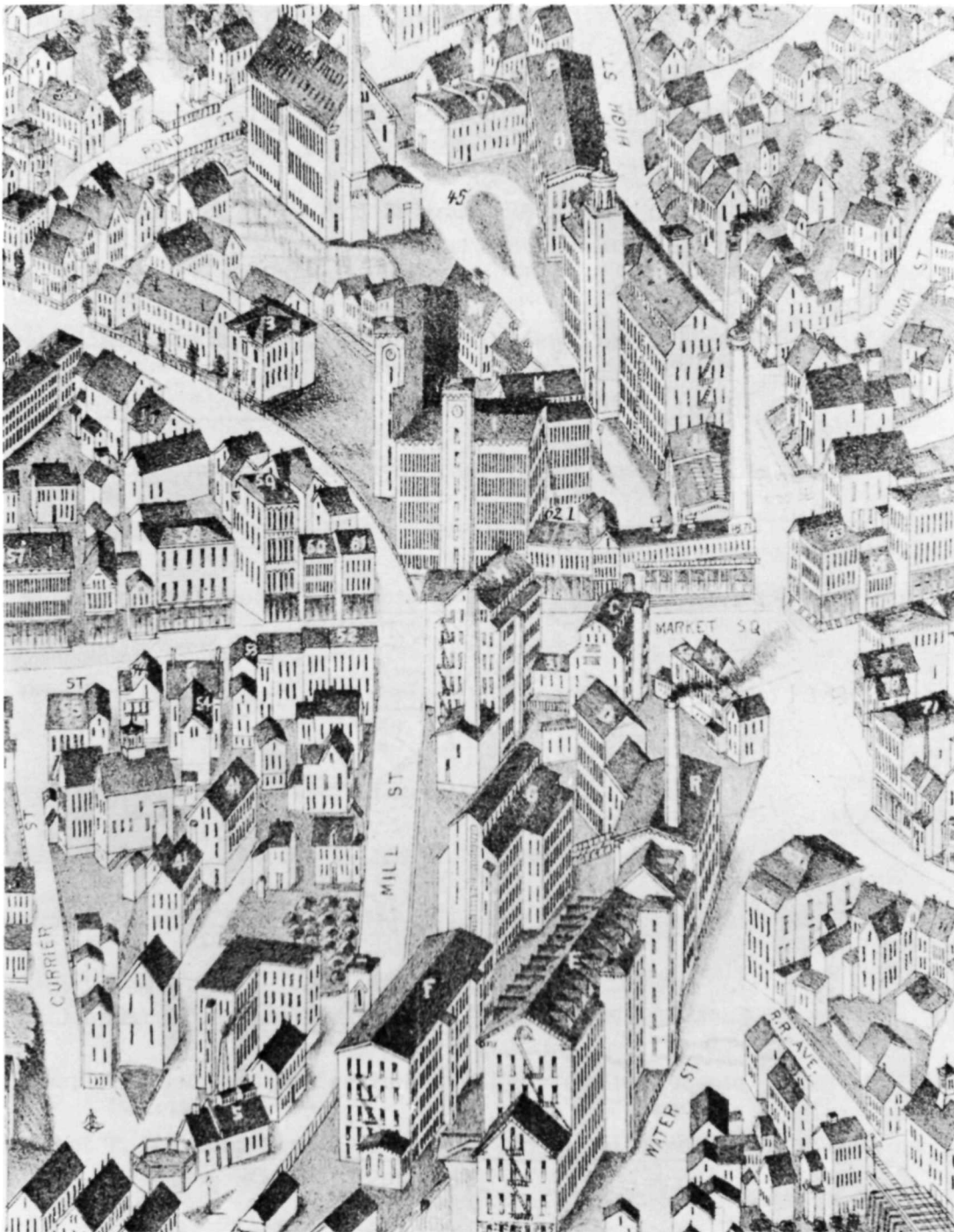
Margaret T. Parker, Lowell, a Study of Industrial Development (New York, 1940) [Parker]

Proprietors of Locks and Canals Records, Boott Mills Properties, Lowell Technological Institute Library, Baker Library, Harvard University [PLCR]

Standard History of Essex County (Boston, 1878) [SHEC]

Orra Stone, Massachusetts Industries (Boston, 1929), 4 vols. [Stone]

Tenth Census of the United States, 1880, vol. XVI, Water Power [Census, vol. XVI]



The Hamilton Woolen Mills Complex - Amesbury, 1880
Mill no. 1 is A, no. 2 is B, no. 3 is C, no. 3 1/2 is D. Mills 4
through 14 1/2 correspond with E through P. Mills no. 15, 15 1/2,
and 16 are Q. Mill no. 17 is R.
(MVTM Collections)

AMESBURY

Bulk Products Industries

HAMILTON WOOLEN COMPANY
Water, Main and High Streets
Amesbury

Newburyport West
19.342160.474660

The woolen industry began early in Amesbury. In 1812 a two-story brick satinet mill was built by Paul Moody and Ezra Worthen, who played such important roles in Lowell a decade later. In 1813 a local ironmaker named Morrill began a second woolen mill, which was bought in 1822 by Amos Lawrence and run by Joshua Aubin as the Amesbury Flannel Manufacturing Company. It was also in 1822 that the Salisbury Manufacturing Company was organized with a capital of \$200,000. The Moody mill and a second mill, built in 1820, were bought by this new corporation. During the years 1822-1856, the company prospered and built a number of mills along the Powow River, but in 1857, during the panic, the mills suspended operations. Reorganized the next year as the Salisbury Mills, the company continued to operate until 1880, when they were once more closed. In 1881 a new organization began operations in the mill buildings under the name of the Hamilton Woolen Company. Operations must have been sluggish, because in 1900 the company removed all of its woolen machinery and replaced it with cotton machinery (63,000 spindles and 1,800 looms). Operations were continued until 1913, when they were suspended for the last time. The mill buildings have been tenanted ever since. The buildings are located so as to take advantage of the five falls provided by the Powow River within a space of about 400 feet. Only one of these falls, at the "upper pond" immediately below the Pond Street Bridge, still has its wooden dam in operation (rebuilt in 1960). The other four dams have been removed. In 1900 the mills had ten turbines of unknown type which developed no more than 700 HP during optimal conditions. In 1871 the Salisbury Mills built two boiler-engine houses with ten boilers and engines of unknown capacity. One of these boiler-engine houses, on Water Street, is a brick three-story structure which appears to be a textile mill building except for a large, octagonal, brick chimney which protrudes from the roof. The second boiler-engine house, near High St., is much more conventional. Of the surviving mills, the oldest is mill No. 2 on High St. (1825). Originally five stories high with a loft and basement, and a clerestory monitor roof, 150' x 35', the building is now only four stories high. The clerestory monitor and fifth floor were removed around 1885. Its stair tower, which was originally fitted with a cupola, now stands five stories high, without the cupola. One notable feature of this mill is the design of its window lintels. The lintel consists of a single horizontal row of brick headers, with no attempt at an arch. Beside this building, also on High St., is a brick three-story mill, No. 14, 150' x 35', with a shallow pitch roof. This building is very similar to the 1825 mill, and may have been built at about the same time, with its upper floors being removed during the 1870s. Other mills in this High St. complex are mill No. 1, built in 1855, three stories with a pitch roof, 150' x 40', with granite lintels and globe windows, and mills No. 11 (ca. 1870), No. 15 (1870), No. 12 (ca. 1835), and No. 13 (ca. 1850). Across Main St. from the High St. complex is the Water St. - Mill St. complex of mills. The 1812 and 1813 mills, now destroyed, were sited on Mill St. The only remaining mill building on Mill St. is an 1848 mill, brick, two stories, which is on

the corner of Mill and Main Sts. The mill was originally five stories with a pitch roof, dormers, and two stair-water towers. On Water St. is an 1854 brick mill, No. 4, 200' x 50', five stories with a pitch roof, dormers, and two stair-water towers. A small brick wheel house is attached to the eastern end of this mill. The mill is essentially intact, and is a good example of Greek Revival mill architecture. On the west side of mill No. 4 are the boiler-engine house (1871), and mill No. 3 1/2, which was probably built in 1820 as part of a mill which faced on Main St. and has since been removed. Mill No. 3 1/2 is a dilapidated three story structure with a pitch roof, 40' x 20'.

(J. J. Allen, History of Amesbury and Salisbury Mills, 1708-1888 in Amesbury Library; Amesbury birdseye maps, 1880, 1890, 1911 in office of Gould Insurance Agency, Main St., Amesbury; Amesbury Daily, Souvenir of 1901 in Amesbury Library; J. Merrill, History of Amesbury (Haverhill, 1880); Sara L. Redford, History of Amesbury (Amesbury, 1968).)

Manufacturing Industries

GRAY AND DAVIS
Oakland and Marston Streets
Amesbury

Newburyport West
19.342860.474630

The Gray and Davis Company was organized in 1890 to manufacture lamps for carriages. In 1900 the production was switched to automobile headlights, and in 1920 the company was one of the largest producers of headlights in the United States. In 1922 the company was reorganized under the name AGA Auto Lamp Company, but the product remained the same. Since the 1930s the wooden and brick one and two story buildings with flat roofs and monitors have been tenanted. They are in a dilapidated condition.

(Stone)

WALKER BODY COMPANY
Oak Street
Amesbury

Newburyport West
19.342800.474600

The Walker Body Company manufactured carriages in the former Colchester buildings, at Elm and Clark Streets, and in buildings in the Carriage Hill complex. In 1919 the firm, which had been manufacturing metal automobile bodies since 1911, moved to a new three story wood building on this site, and occupied a brick building dating from about 1890 which had belonged to the carriage making firm of Howarth and Rogers. In 1930 the Walker Company went bankrupt. The buildings, which are in good condition, have been tenanted ever since.

(Sara L. Redford, History of Amesbury. (Amesbury, 1968)

LOWELL BOAT COMPANY
near intersection of Main Street and Clark's Road
Amesbury

Newburyport West
19.343550.474480

The Lowell Boat Yard was established in 1793 by Simeon Lowell, a retired sea captain. From its earliest days, the company specialized in the manufacture of dories, initially for the use of local residents on the Merrimack River, but soon afterward for the fishing fleets of New England. The banks dory was perfected at the Lowell yard, and one example of this type of dory is still on the premises. The current owner, Ralph Lowell, estimates

that 250,000 dories have been built by the company since 1793. The company still manufactures dories and skiffs and performs repairs and modifications on wooden hulled boats up to 25 feet in length. The original building, dating from about 1795, survives largely unchanged. It is two stories with a basement, of wood, 25' x 45', with a steeply pitched roof. Construction throughout is of mortised and tenoned joints and wooden pegs. The beams for both the first and second floors are 25' lengths of pine, supported in their centers by wooden pillars. Iron rods from the lower chord of the roof trusses provide further support for the second floor. The floor consists of a single layer of splined pine planks. To the northeast of the 1795 building is an 1830 building identical in size to the older structure, except for a smaller height in the second story. It, too, has mortised and tenoned joints with a mixture of wooden pegs and wrought iron nails. A third building was completed in 1960, and the office shed was built around 1942. Not until well into the twentieth century was electrical power introduced to the Lowell Boat Yard. Until then virtually every operation was performed by hand.

(Stone; Ralph Lowell, owner, Lowell Boat Yard)

BRIGGS CARRIAGE COMPANY
Cedar and Poplar Streets
Amesbury

Newburyport West
19.342560.474700

The Briggs Carriage Company began operations in 1866, occupying a mill building on Clark and Elm Streets which was either burned or otherwise destroyed around 1882. In 1883 the company moved to the site at Cedar and Poplar Sts., and in the years 1883-1890 they built three mills and two boiler-engine houses to carry on their extensive operations as one of Amesbury's largest carriage makers. In 1900 the company began to make automobile bodies, but the bodies were of wood and very similar to carriage bodies. Not until around 1913 did the company shift to aluminum and steel bodies. In 1929 the company went out of business, like all of Amesbury's auto body industry, and the mill buildings were occupied by the Merrimac Hat Company. Since 1959 the buildings have been either empty or occupied by the Henschel Corporation which manufactures electrical components. The buildings are similar in design to small textile mills, being brick, two, three or four stories in height, with shallow pitch roofs, stair-water towers, and separate brick boiler houses.

(Amesbury birdseye maps, 1880, 1890, 1911 in office of Gould Insurance Agency, Main St.; Amesbury; Amesbury Daily, 1913 and 1938 (special editions in Amesbury Public Library; Margaret Rice, Sun on the River (Concord, N. H., 1955).)

"CARRIAGE HILL COMPLEX"
Elm Street between Washington and Oak Streets
Amesbury

Newburyport West
19.342620.474644

The factory buildings in the Carriage Hill Complex were often occupied by one or more carriage manufacturers, the most important of these companies being Clark, Biddle and Smart, Babcock, and Bailey. In a huge fire in 1888 almost all of the original wood and brick carriage factories on the hill were destroyed, but during the years 1889-1900 these buildings were replaced by the existing structures. During the twentieth century these buildings were largely absorbed by Biddle and Smart and the Bailey Company, which produced auto bodies, electric automobiles, and auto accessories. Biddle and Smart produced

41,000 bodies in 1926 for the Hudson Automobile Company. In 1929 Biddle and Smart went out of business, and the buildings were occupied by the Bailey Company which has continued to manufacture window channels and other auto accessories to the present day. The Carriage Hill buildings are identical to textile mills of the period, being rectangular, brick buildings with stair-water towers, two to four stories high, with flat or shallow pitch roofs. The entire power supply of these companies was steam. (Amesbury Daily, special editions, 1890, 1901, 1913, 1938; Margaret Rice, Sun on the River (Concord, N. H., 1955).)

MERRIMAC HAT COMPANY
near intersection of Beacon and Merrimack Streets
Amesbury

Newburyport West
19.342300.474420

In 1838 Isaac Martin began the manufacture of hats in a small way near his farm, but in 1860 he entered a partnership with Abner L. Bailey and a small wooden mill was constructed near Bailey's Pond, which was dammed, enabling the mill to obtain a small amount of water power as well as water for its boilers and for its wet finishing machinery. From 1860 to 1866 the company was known as Amesbury Hat and Horton Hat, but from 1866 onward the name Merrimac Hat became permanent. The Civil War was a period of large growth for the company, and growth continued until the 1940s and early 50s. This company was easily the most prosperous of all of Amesbury's industries. During the 1930s the company expanded into the buildings of the Briggs Automobile Body Company near Clark's Pond, and during World War II over 500 people worked in the two mill locations. The "hatless 50s" caused the company to suspend operations in 1959. The buildings have been tenanted ever since by smaller industries. This card will deal only with the mill properties near Bailey's Pond. The oldest building is a wood frame structure, 75' x 40', two stories with a pitch roof, which was probably built around 1865. To the immediate right of the wooden mill (southwest) is an 1890 mill, three stories, brick, with a flat roof. Next to this mill is an attractive three story brick building 100' x 40', dated 1877, with a pitch roof and a handsome stair-water tower. To the right of this building, along Merrimac Street, is a three story mill, brick, dated 1908, of standard construction.

(Amesbury Daily, 1913 and 1938; Barlow; Pettengill MSS, Amesbury Public Library)

Bridges

POND STREET BRIDGE
Pond Street between Friend and High Streets
Amesbury

Newburyport West
19.342120.474660

The Pond Street bridge was built around 1830 in order to cross the Powow River upstream of the Salisbury Manufacturing Company mill buildings. It is a stone arch bridge, constructed of random coursed granite rubble with a segmental arch of quarry finished granite blocks. The arch has a 15 foot span and 6 foot rise. The total length of the bridge, including abutments, is 50 feet, and it is 20 feet wide.

(Joseph Merrill, History of Amesbury (Haverhill, 1880); Pettengill MSS, Amesbury Public Library)

POWOW RIVER BRIDGE
Main Street over Powow River near Merrimack Street
Amesbury

Newburyport West
19.432660.474471

This attractive inclined chord, riveted, lattice girder, Warren truss, through swing bridge was constructed in 1900 by the Boston Bridge Works. The original construction was unchanged until 1970 when the turntable was de-activated, and the stringers and deck were replaced. There is only one 90 foot span. The two end panels are reinforced with subverticals and struts. The depth of the truss at the center is 10 feet and the upper chord is sharply inclined in order to reduce the weight of the cantilevered sections of the span. The upper lateral system is particularly sturdy, consisting of double diagonals of lattice girders. The turntable is about 20 feet in diameter and appears to be in serviceable condition.

(Commonwealth of Massachusetts, DPW; Pettengill MSS, Amesbury Public Library)

Specialized Structures

LAKE GARDNER DAM
Southern corner of Lake Gardner
Amesbury

Newburyport West
19.341660.474684

The Lake Gardner Dam was constructed by the Salisbury Mills in 1872 in order to create a more reliable reservoir for the Powow River in periods of low water. The dam is earthen with a masonry spillway near its eastern end. It is 750 feet in length, including the 50 foot spillway. The dam averages 15 feet in height. It is 35 feet thick at its base and 8 feet thick at its top. The spillway is constructed of granite blocks, with a batter of approximately one in three. The wingwall of the spillway is granite rubble. On the eastern end of the spillway is a headgate which was installed about 1930 by the Amesbury hydro-electric company, which bought the dam from the Hamilton Woolen Company in 1914. This gate supplied water to a small turbine located in a brick turbine house immediately below the spillway. The house is now abandoned. None of the water of the Powow River or Lake Gardner is being used to generate electricity.

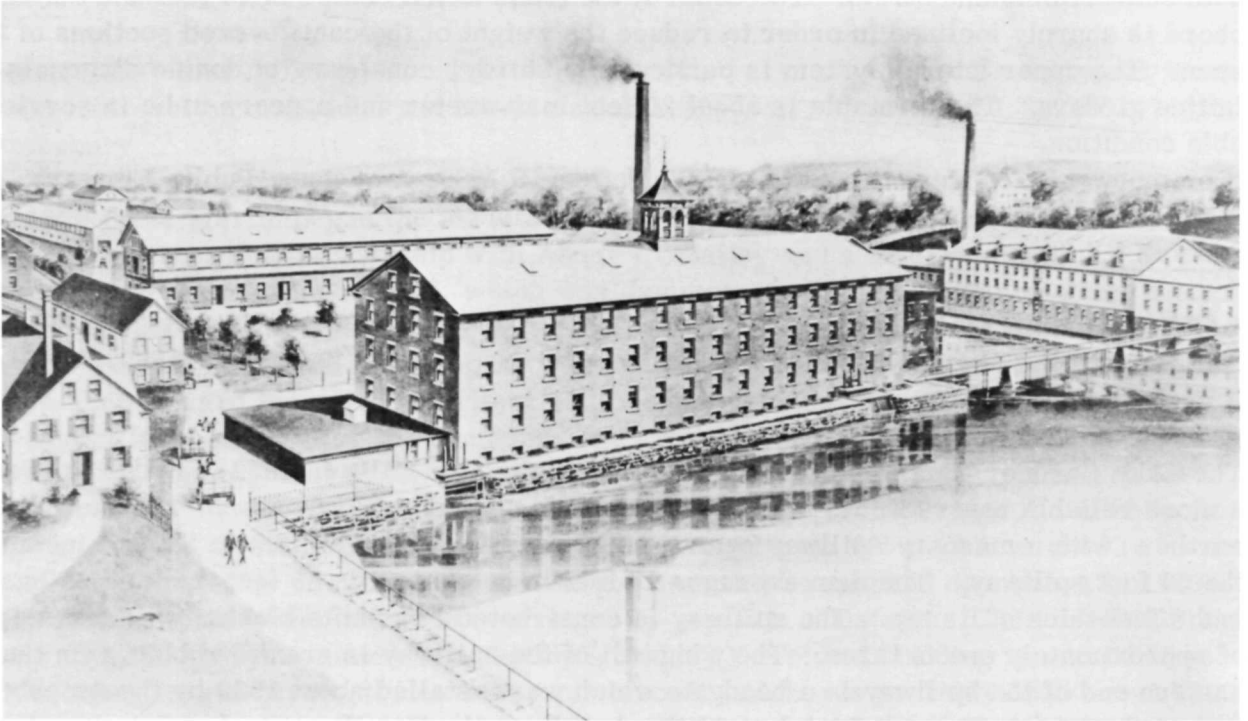
(Amesbury Daily, 1913, 1938; Sara Redford, History of Amesbury (Amesbury, 1968).)

POWDER MAGAZINE
200 meters NE of Monroe and Madison Streets
Amesbury

Newburyport West
19.343630.474641

This powder storage house was built around 1800 to supplement an earlier magazine which has since been destroyed. The structure is cylindrical in section with a domed roof. It is about 10 feet in diameter and 15 feet high. It was constructed of uncoursed stone rubble set in mortar, but only a small portion of the original stone is visible. At an undetermined date the structure was covered with cement, followed by a layer of plaster. The door is completely covered and is not visible.

(Joseph Merrill, History of Amesbury (Haverhill, 1880).)



Ballardvale Woolen Mills, Andover, Massachusetts, ca. 1900
(MVTM Collections)

Well Known Industrial Structures No Longer In Existence

Perkins Nail Factory, Amesbury (ca. 1810)	Newburyport West	19.342220.474661
Moody and Worthen Satinet Mill, Amesbury (1812)	" "	19.342280.474656
Morrill-Aubin Satinet Mill, Amesbury (1813)	" "	19.342340.474651

ANDOVER

Bulk Products Industries

AMERICAN WOOLEN COMPANY SHAWSHEEN MILLS	Lawrence
York and Haverhill Streets	19.324140.472668
Andover	

The Shawsheen Mills were built as the model mills of the American Woolen Company as part of president William M. Wood's idyllic community in Andover of mills, office buildings, and executive housing for the huge company. The workers in the mills lived, for the most part, in nearby South Lawrence. The mills, which were completed in 1920, were powered by electricity which was produced at the Shawsheen power plant on the Shawsheen River. The boiler house is still in use but all original equipment has been removed. The mills continued to function until the 1950s when they were sold to a number of smaller industries. The mills consist of two spinning-weaving mills, five stories high with basements, each 450' x 150'. These buildings are connected at their eastern ends. They are constructed of reinforced concrete and brick. On the northern side of these buildings is a ten story wool storehouse which is trapezoidal in shape, 160' x 150' x 175' x 130'. The store house is also constructed of reinforced concrete and brick.

(Stone; American Woolen Co. Brochure, 1925, MVTM)

BALLARDVALE MILLS	Lawrence
204 Andover Street	19.323000.472150
Andover	

The Ballardvale Woolen Mills were established in 1835 by John Marland, the son of an early Massachusetts woolen manufacturer, on the site of a saw and grist mill on the Shawsheen River. Marland was an ambitious and daring manufacturer, and by 1848 he had erected two large mills, powered by water and steam, a sizable storehouse, and several smaller frame buildings. In 1841 Marland imported English worsted machinery for the purpose of manufacturing delaines, a cloth woven with yarns of worsted and cotton. This was the first instance of American worsted making by power driven machinery, and was apparently not entirely successful. In 1857 Marland went bankrupt, and the mills passed under the control of Josiah P. Bradlee, a Boston merchant who was Marland's chief creditor. Under Bradlee's conservative leadership the company fell back upon the manufacture of flannels composed of a cotton-woolen blend. In 1872 the mills contained 13 sets of cards, 104 broadlooms, and employed 200 hands, making it one of the larger woolen mills in New England. The company went out of business in the 1950s and the buildings have been tenanted ever since. In 1872 power was by water

(160 HP) and steam (100 HP). A masonry dam, 200 feet in length, built in 1835, provided about 12 feet of fall. None of the water wheels or engines have survived. The 1835 mill is intact, although the skylights in the pitch roof have been shingled over and the cupola has been removed. The mill is four stories high, brick, 150' x 45'. The picker house, engine, wheel and boiler house which were attached to the main mill have been removed. A wool storehouse, built in 1848, is constructed of uncoursed granite rubble and brick. About 1880 an almost identical storehouse was built across the street from the 1848 structure. Two large wooden structures, about 200 feet to the north of the 1835 mill, which were used for tenting, are intact. In 1842 Marland built another large mill, the first floor of which consisted of random coursed granite rubble. The upper two stories were of wood. The mill had a pitch roof, with skylights and dormers, which have since been removed. The wooden parts of the mill have also been covered with asbestos shingles. The mill and wheelhouse, also dating from 1842, are largely intact, as well as the attached boiler-engine house (1842) and dyehouse (1871).

(K. E. Foster, ed., Lamb's Textile Industries of the United States (Boston, 1916), vol. II; HHEC; Insurance Survey #788 "Ballardvale Mills", MVTM)

MARLAND WOOLEN MILLS
Stevens and North Main Streets
Andover

Lawrence
19.324000.472540

In 1820 Abraham Marland bought the property on this, the third mill power of the Shawsheen River in Andover, and erected a brick woolen mill. The site had been in use since 1775 as a powder mill, and later as a paper mill. The Marland Mills expanded throughout the nineteenth century, being absorbed by the M. T. Stevens Woolen Company in 1879. The Stevens management greatly enlarged the plant in the years 1883-1925, in the course of which the original mill buildings were removed. During the 1960s the Stevens Company closed operations in the mills, and they have been tenanted ever since. The oldest surviving building is the 1830 brick mill on the west side of the river directly downstream of the dam. Only the first three stories have survived, the fourth story and pitch roof having been removed around 1910. Next to this building is an 1850 boiler house and dyehouse, to which a number of modern brick structures have been appended. The round chimney dates from the 1880s. To the west of these buildings, along Stevens Street, is an 1883 spinning-carding mill, to which a fourth story was added in 1925. The saw-tooth roof weaving building to the north of the 1883 mill was built in 1925. On the east side of the river, beside the dam, is a two story picker house which was erected in 1850. Beside this building is an 1864 spinning-finishing mill, also two stories, to which an office building was added in 1880. A number of brick additions have been made to these two mills, mostly dating from the years 1925-1940, which almost obscure the older mills from view. The water power system was rebuilt in the early twentieth century, and the original system was greatly modified. Two inoperative turbines of unknown make, dating from the 1920s, remain in place. The dam is reinforced concrete and masonry and averages 4 to 5 feet in height. It rests upon a natural fall of about 10 feet.

(Bagnall; Insurance Surveys, 1872-1926, MVTM; Stone)

SMITH AND DOVE FLAX MILLS
Railroad and Essex Streets and Red Spring Road
Andover

Lawrence
19.324000.472460

This site on the second of four millpowers on the Shawsheen River was originally used by Abraham Marland, who in 1807 erected a cotton mill near the Essex St. stone arch bridge. In 1814 the Abbot brothers, Paschal and Abel, erected a wooden mill on the west side of the river, near Red Spring Road, and began spinning cotton and woolen yarn as well as weaving flannels. In 1824 James Howarth and his son John erected a stone mill on the east side of the river and manufactured flannels. Both the Howarths and the Abbots went out of business in 1837, and the mills were generally vacant until 1843, when John Dove and the brothers Peter and John Smith, purchased the property and began the manufacture of linen yarn, twine, and sail cloth. Smith and Dove had been making linen yarn since 1836 in their mills in Frye Village, which were entirely destroyed in 1918 as part of the Shawsheen Village project of the American Woolen Company. The Smith and Dove Company continued to operate until 1928, when it was absorbed by the Ludlow Sales Corporation. In the 1930s this company failed, and the buildings have been tenanted ever since. Most of the original mill buildings were replaced in the years 1894-1910 by new buildings which were designed by the Charles Main Company of Boston. The 1814 wooden mill of the Abbot brothers is still in existence. It is a shingled two story structure with a pitch roof. Many of the original shingles have been replaced by asbestos shingles. The roof is supported by a combination king post-queen rod truss. No trace of the original wheel house survives. The 1824 stone mill is still in existence, although the third story, with its clerestory monitor roof was removed, and two stories of brick were added. A series of brick storehouses, dating probably from the years 1850-1860, are still in use, although greatly altered. All of the remaining buildings date from the period 1890-1925. (Sarah L. Bailey, Historical Sketches of Andover (Boston, 1880); HHEC; Plans, Surveys and Drawing, MVTM; Stone)

Manufacturing Industries

TYER RUBBER COMPANY
Lewis and Main Streets
Andover

Lawrence
19.32420.472510

In 1856 Henry G. Tyer, an English immigrant who had received some training in the rubber industry in New Jersey, established in Andover a small factory for the manufacture of rubber cement in buildings owned by the Boston and Main Railroad. He soon began making rubber shoes, and in 1876 the Tyer Rubber Company was incorporated in a brick mill, 80' x 30', on the site of building No. 3 of the present mill. Tyer obtained patents on the manufacture of rubber compounded with zinc oxide, and he used this product to dominate the manufacture of water bottles and syringes. The business expanded to include a wide range of small items, such as rubber bands and pharmaceutical accessories, but the major product was rubber footwear. Tyer died in 1881, but his son Horace continued the business. In 1909 the company began making automobile tires and tubes, and in 1912 the old plant was demolished and a new plant, occupying 233,000 square feet, designed by the mill engineering firm of Charles Main, was

erected. In 1922 the company ceased the manufacture of tires and expanded its production of rubber footwear and small items, such as piano tubing, hot water bottles, tobacco pouches, and the like. The company has continued to operate to the present day, as a division of the Converse Corporation. The present mills, boiler and engine house were designed by Charles Main and completed in 1912. Power was entirely by steam and consisted of two Rice and Sargent receiver cross compound condensing engines. Both of the engines, which developed 1000 and 750 HP, are intact, together with the rope drive pulley system for the 1000 HP engine and a Westinghouse DC generator for the 750 HP engine. In addition, a small Rand-Ingersoll compressor, with a flyball governor, dating from about 1900, is in place on the level below the main engine room. In the boiler room are 4 horizontal return tubular boilers, made by the Robb Engineering Co., Ltd. of South Framingham, MA.

They are dated 1912. There are three mill buildings, each of four stories, constructed of brick, and designed according to standard mill construction principles of the early twentieth century.

(HHEC; Charles T. Main Co. trade catalogue (Boston, 1915), vol. 2; Stone)

Transportation

PASSENGER STATION	Lawrence
Essex and Railroad Street	19.324120.472470
Andover	

This station replaced an earlier wood structure around 1910. It is a single story brick building with granite coursing and a rounded hip roof. The station is 50' x 20', with a passenger arcade that extends for fifty feet, parallel to the tracks. The roof of the arcade is supported by wooden pillars and brackets.

(City Atlas of Lawrence and Andover, 1896, 1906, 1926)

Bridges

STONE ARCH BRIDGE	Lawrence
intersection Essex Street and Shawsheen Road	19.324000.472480
Andover	

This stone arch bridge was probably built around 1820 in order to connect the mill districts on the west bank of the Shawsheen River with the main area of the town. It was originally 15 feet wide, and was made of uncoursed stone rubble, set without mortar. The arch stones are rough cut granite blocks, set without mortar. The arch is segmental, with a span of 15 feet and a rise of 6 feet. The total span of the bridge is 35 feet. In 1920 the bridge was widened by 15 feet by means of a reinforced concrete arch. A concrete guard rail was also added to the bridge at this time.

(Sarah L. Bailey, Historical Sketches of Andover (Boston, 1880).)

BALLARDVALE MILL BRIDGE	Lawrence
200 feet downstream of Ballardvale Dam	19.323040.472150
Andover	

This bridge appears on an insurance survey of 1872, and as such it is one of the oldest surviving wrought iron truss bridges in the Merrimack Valley. It is a through, pin-

connected, lattice and plate girder, Pratt truss bridge, 15 feet wide, 35 feet in span, and 7 feet in height. The bridge rests on stone retaining walls and connects the two mill yards of the Ballardvale Woolen Company. The deck has been removed. There are four panels. The two center panels have double diagonals. All diagonal members are wrought iron rods, connected by pins to the lower chord, bolted to the upper chord, and tensioned by turnbuckles. The verticals are lattice girders. The upper chord consists of plate girders. The lower chord is formed by several wrought iron bars connected to each other and to the upper chord by pins. There is no upper lateral system. The deck was supported by four plate girders, and stiffened by four sets of double diagonal wrought iron rods. Several of these diagonals have buckled.
(Insurance Survey No. 788, "Ballardvale Mills," MVTM)

Specialized Structures

SHAWSHEEN GARAGE
Haverhill Street and Riverina Road
Andover

Lawrence
19.323780.472650

The Shawsheen Garage was built by William M. Wood, president of the American Woolen Company, as part of his brain child, the Shawsheen Mill Village. Wood, who built dozens of housing units in the Village for American Woolen Company executives, did not approve of individual garages, and hence built the Shawsheen Garage to store the cars of Shawsheen residents. The garage is shaped like an inverted L, is 2 stories high, constructed of brick and reinforced concrete, and was capable of storing over 400 cars of the 1920s era. Its bays are decorated with very elaborate neo-colonial facades.
(American Woolen Company brochure, ca. 1925, MVTM; Dr. Edward G. Roddy, History Department, Merrimack College, North Andover; Stone)

BILLERICA

Aqueducts

SHAWSHEEN AQUEDUCT
Route 129 at Wilmington-Billerica town lines
Billerica

Wilmington
19.318160.471500

The Shawsheen Aqueduct is the largest and best preserved of all the structures on the Middlesex Canal, which flowed from Middlesex Village to Boston, and which was built by William Weston and Loammi Baldwin, Sr., in the years 1795-1803. Since work on the canal began in Billerica, the aqueduct was probably completed around 1796. It was constructed to allow the canal to cross the Shawsheen River. It consists of two wing abutments on either river bank, constructed of granite blocks in a rough approximation of an English bond (one row headers, one row stretchers). No mortar was used. The wing abutments are approximately 50 feet in width and 20 feet high. In the center of the river is a rectangular pier, also constructed of granite blocks set in an English bond. The pier is 6 feet wide, 20 feet long and 20 feet high. A considerable number of the stones of the pier have been rolled into the river by vandals. No sign of the

aqueduct itself, which was made of wood, has survived. In both wing abutments and on each side of the central pier a row of stretcher granite blocks was cut to form an outcropping channel approximately 6 inches wide. The wooden braces for the aqueduct were fitted into these channels. The entire span of the aqueduct is 30 feet.

(Middlesex Canal Association, Inc., Box 333, Billerica, MA 01821; National Register Inventory Form, 21 August 1972; Christopher Robert, The Middlesex Canal, 1793-1860 (Cambridge, MA, 1938).)

BYFIELD

Bulk Products Industries

BYFIELD SNUFF MILL NO. 1
Larkin Street at Parker River
Byfield

Georgetown
19.341060.473468

This was the earliest snuff company to be established in Rowley. It was put into operation in 1804 by the Larkin and Morrill family of Newbury and Rowley. It was purchased by the Pearson family around 1830. The mill was used to manufacture snuff at intermittent periods from 1804 to 1950, when operations ceased. The mill still contains machinery dating from the mid-nineteenth century, as well as a water turbine of unknown make. At the time of this inventory entrance to the mill was not possible because of drifted snow. The building dates from the early nineteenth century. It is wood, about 45'x20', two stories with an attic. The pitch roof is equipped with skylights. The dam for this mill, as well as the headrace and penstock, were rebuilt with reinforced concrete in 1914. The dam produces a fall of about 10 feet.

(Conversation with co-owner of Byfield Snuff Mill, Mr. Pearson)

BYFIELD SNUFF MILL NO. 2
near intersection of Main Street and Parker River
Byfield

Newburyport West
19.340600.473532

Mill No. 2 of the Byfield Snuff Company was originally a sawmill which began operations around 1830. In 1860 the property was bought by the Pearson family of Newbury and Rowley, and snuff grinding machinery was installed. The mill has been used continuously ever since. There are four main buildings. The oldest is the converted sawmill which lies by the reinforced concrete dam and wasteway (1906). The penstocks for this mill were also rebuilt in 1906. The dam produces about 11 feet of fall. The mill is wood, 50'x50'. It is 2 stories, with an attic and basement. It has 3 turbines. One is horizontal, of unknown make, and it drives a 230 volt DC generator, providing electricity for light. The other two turbines are Holyoke Machine Co. "Hercules" vertical wheels, each 36" in diameter. Both of these wheels drive the machinery in the mill by means of leather belts, shafting and pulleys. The tobacco grinding and sifting machinery dates from the years 1860-1890. West of the mill is a wooden building dating from about 1880, which is used as an office and packing house. It is shingled, 2 stories, with a basement and attic. In the basement of this building is a horizontal return boiler made by John

B. Adt of Baltimore, Md., dated 1885 and 1899. Next to the boiler is a small slide valve single cylinder non-condensing steam engine of unknown bore and stroke, manufactured by the Erie City Works of Erie, Pa. The most recent patent date, on a bearing cover, is 1891. It is equipped with a flyball governor of unknown date of manufacture, made by the Gardner Governor Co. of Quincy, Illinois. The engine has two flywheels. This equipment has not been used since 1930. Beside the building to its north is a reinforced concrete chimney, 60 feet high and 7 feet in diameter at the base, dated 1906. Two reinforced concrete storage sheds, each about 45'x60', were built in 1911 and 1913. The operation of the mill is almost identical to that of the gravity fed flour mill introduced to the United States by Oliver Evans in the 1790s. (Newburyport City Atlas, 1914; conversation with Mr. Pearson, co-owner of Byfield Snuff Company)

BYFIELD SNUFF COMPANY SAWMILL
unimproved dirt road 250 yds. south of Forrest Street
Byfield

Newburyport West
19.340140.473550

This sawmill, dating from about 1860, was purchased around 1870 by the Byfield Snuff Company and was used to manufacture veneer until the 1930s. From that date onward the mill has been sporadically used to manufacture snuff. It has not been used for the past ten years, but has been kept in excellent repair. The mill is a wood structure of one story with an attic and basement, 20'x50', with an attached wheelhouse. Part of the stone rubble foundation was patched with concrete in 1914, and it was at about this time that the stone dam, headgate and penstock were rebuilt. The mill was powered by a vertical "Hercules" turbine made by the Holyoke Machine Co. about 1880. It is still operable, and is connected to the shafting of the mill with its original gears and shafts. Its flyball governor, which is no longer attached, has no maker's name plate or dates, but appears to have been made around 1900. In addition to tobacco grinding machinery, the mill still contains a small rotary saw, a planer, bandsaw, horizontal drill, and joining machine. (Newburyport Atlas, 1914; conversation with Mr. Pearson, co-owner of Byfield Snuff Company)

CHELMSFORD

Extractive Industries

CHELMSFORD LIME QUARRIES AND KILNS
100 meters NE of intersection of Beaver Brook and Route 110
Chelmsford

Billerica
19.305700.471820

These limestone quarries, with accompanying kilns, were put into operation about 1740 and remained in use until about 1830. They supplied the blast furnaces of North Chelmsford and Westford with lime flux. The three quarries have been preserved by the town of Chelmsford as part of a scenic trail. The kilns are in ruins. Two other quarries on the north slope of Robbins Hill were used during the same period.

(HHMC)

DRACUT

Bulk Products Industries

COLLINS WOOLEN COMPANY
Lakeview Avenue and Beaver Brook
Dracut

Lowell
19.307380.472810

A small cotton mill was erected on this site in 1851, but was converted to a woolen mill in 1863. In 1879 Michael Collins purchased the site, renovated the 1851 structure and built several brick mill buildings of conventional design. In 1899 the Collins Company was absorbed by the American Woolen Company and additional buildings were constructed. Operations were suspended about 1955 and the buildings are now tenanted. The oldest surviving building is the brick structure on the downstream side of Lakeview Avenue. The first 3 stories were constructed in 1884 and the remaining 3 were added in 1893.

(Mills of the American Woolen Company (Boston, 1901).)

MERRIMACK WOOLEN MILLS
100 Pleasant Street
Dracut

Lowell
19.30950.472595

The site of the Merrimack Woolen Mills, at the lower falls of Beaver Brook, had been used by fulling and grist mills since the late 18th century. Around 1840 a wooden frame building was erected by the dam and was used as a woolen mill by the Baldwin Woolen Co. of North Chelmsford. Under new ownership in 1858, the buildings became known as the Merrimack Woolen Co. In 1862 new brick buildings replaced those of wood, but the entire complex was destroyed by fire in 1864. New buildings were erected during 1865 and 1866. Not until the early 20th century, after the company had been absorbed by M. T. Stevens, were any new buildings constructed. Power was by means of both steam and water, about evenly divided. The main mill, which parallels Pleasant St., is standard mill construction of the late 19th century. Since it was built in 1865, it is a very early example of what came to be called "standard mill construction." It is 4 stories high, 172' x 51', with a stair-water cistern tower in the center of the building. It has a shallow pitch roof and iron cornices. The remaining buildings, which date from 1865-1866, are constructed of uncoursed granite rubble. The picker house is 3 stories high with a shallow pitch roof. It is 125' x 40', with brick and stone fire walls at 20 foot intervals. The storehouse, parallel to Pleasant St., is also of stone construction, one story high, 150' x 50', with fire walls at 60 foot intervals. The original boiler house, engine house, finishing building, and smithy have been replaced by 20th century mill buildings.

(Barlow No. 4711; HHMC; Illustrated History of Lowell (Lowell, 1897); Lowell of Today (Lowell, 1897).)

Bridges

STONE ARCH BRIDGE

Lakeview Avenue and Beaver Brook
Dracut

Lowell

19.307460.472810

This double stone arch bridge was probably constructed around 1850 as the nearby textile mill complex grew in size and importance. The bridge has two segmental arches, each with a span of about 12 feet and a rise of about 5 feet. The total length of the bridge is 40 feet, and it is 30 feet wide. Construction throughout is of random coursed granite rubble.

FORGE VILLAGE

Bulk Products Industries

ABBOTT WORSTED COMPANY

Pleasant and Prescott Streets
Forge Village

Westford

19.295980.471696

The Abbott Worsted Company, which began operations in Graniteville, MA in 1858, had expanded in 1878 beyond the capabilities of that town. The buildings of the Forge Village Horse Nail Co. in nearby Forge Village were purchased by Abbott Worsted and by 1879 the company was in operation. The company manufactured worsted and woolen yarn for carpets, and pioneered the use of camel's hair in these yarns (1880). By 1930 the company's plants in Forge Village and Graniteville were the largest worsted yarn manufactories in the world, about 800 people being employed at Forge Village and 300 at Graniteville. The firm went out of business in 1958. Of the original buildings only two of the wooden storehouses remain, and they have been covered with corrugated metal. The next oldest building is the 1887 mill, 3 stories high, 100' x 75', and constructed of brick, with a single water cistern tower. The largest building in the complex is the 1910 mill built on the site of the Horse Nail factory. The stair tower and front of this building is styled in an unusually ornate manner, including an elaborate cupola and bell. Since the officers of the company prided themselves on their concern for the town's beauty, this lavishly designed building is not surprising. The remaining buildings are standard mill construction of the 1890-1920 period. The mill employed some water power, but the low head and small amount of water available led to the early construction of a boiler-engine house. Most of the water was used for boiler feed, scouring, and dyeing.

(Barlow No. 6688; HHMC; Lowell of Today (Lowell, 1893); Stone)

Bridges

PLEASANT STREET BRIDGE
Pleasant and Prescott Streets
Forge Village

Westford
19.295880.471694

This bridge over Stony Brook near the Abbott Worsted Company dam was probably built around 1800, when granite was first quarried in the Westford area. The bridge, which has a span of some 15 feet, is constructed of uncoursed granite blocks, set without mortar. The blocks are extremely irregular in size, and have been crudely quarried. In the center of the span, the blocks rest upon a crudely made pier of large granite blocks. The roadbed of the bridge is 10 feet above the level of the brook, and the bridge is 30 feet wide.

GRANITEVILLE

Bulk Products Industries

ABBOTT WORSTED MILLS
North and Broadway Streets
Graniteville

Westford
19.297680.471874

The Abbott Worsted Mills began operations in 1855, under the leadership of John W. Abbott, John W. P. Abbott, and Charles G. Sargent. They manufactured worsted yarn for upholstery and braiding, apparently doing no weaving of their own. The company was thus one of the earliest worsted manufactories in the United States. The building was destroyed by fire in 1858, but in 1860 the mill which survives today was constructed. It was a 2 story, shallow pitch roof building, constructed of coursed granite rubble. Part of the mill was also used by C. G. Sargent for the production of woolen washing and drying machinery. In 1878 the Abbott Company built an extension to the 1860 mill, and moved their worsted machinery into the area previously occupied by Sargent. The original mill was 100' x 50'. The extension, identical in style to the 1860 mill, was 150' x 50'. The mills were powered by a water turbine which developed about 75 HP from a fall of 15 feet, the water being supplied from the ponded Stony Brook. A steam engine, of about 100 HP, was also employed from at least 1877 onward. The company prospered well into the 20th century. After World War II it was absorbed by the Sargent Machine Company. It burned in January, 1976, and its future status is uncertain. (Barlow, No. 5011; HHMC)

Manufacturing Industries

C. G. SARGENT AND SONS MACHINE SHOP
Broadway Street
Graniteville

Westford
19.297710.471865

C. G. Sargent, after several years as an overseer at the Lowell Machine Shop, began his own business as a machinery maker in a number of locations in Lowell. In 1854

he moved his operations to Graniteville and built a small structure on the south side of Stony Brook as well as a large building on the north side, which he shared with the Abbott Worsted Company. He occupied space in the rebuilt Abbott Mill (1860) until 1877, when he began construction on a new building along Broadway Street. Completed in 1878, the new machine shop was a two story shallow pitch roof building constructed of coursed granite rubble, with a turbine house and boiler house as well as several outbuildings. The product of the shop was wool washing and drying equipment as well as wool dusters, pickers, and waste cards. The company is still in business. (Barlow, No. 5012; HHMC)

GROVELAND

Bridges

GROVELAND BRIDGE
Route 97 and Merrimack River
Groveland

Haverhill
19.333540.473640

This through, riveted, plate girder, Pratt truss bridge was built in 1913 by the Boston Bridge Works. George F. Swain was consulting engineer. The bridge has 5 spans, each of 160 feet, and each with 6 panels. The channel of the river is crossed by a single bascule leaf draw, 50 feet long, operated by a quadrant and pinion gear arrangement. The draw mechanism is still in use.

H A V E R H I L L

Bulk Products Industries

PENTUCKET MILLS
Hale and Winter Streets
Haverhill

Haverhill
19.329120.473810

The Pentucket Woolen Mill was established in 1804 as the Hale Cotton Mills, being organized by a Haverhill resident who had previously owned and operated a sawmill and gristmill on the falls of the Little River as it flowed through Haverhill. Sometime around 1825 the mill switched to the manufacture of woolen flannels, and new buildings were added in 1835. Operations were continued by the Hale family until 1852, when the operation of the mill was suspended. Nathaniel Stevens, a woolen manufacturer from North Andover, purchased the mortgage and in 1855 acquired full ownership of the mill properties, which were put back into operation manufacturing flannel as the Pentucket Mills. The Pentucket Mills continued to produce woolen goods as a part of the Stevens group of woolen mills until the 1960s when the buildings were tenanted by a number of smaller industries. The oldest remaining building is mill No. 2, a four story brick structure with a shallow pitch roof which was built in 1876. This building is about 60 feet from the intersection of Winter and Hale Sts. To the south (left) of mill No. 2 is an 1882 four story brick mill. The rest of the buildings date from the

years 1910-1925, with the exception of the "Little Mill," which was built in 1897. This building, which is on Hale St., has a hip roof, very unusual for a textile mill. The weave shed, with its saw tooth roof, is a fine example of the single story weaving building which came into use in New England from the 1880s onward. It was built by Charles T. Main of Boston in 1910
(Bagnall; FM; MSS-MVTM; Stone)

HAVERHILL PAPER COMPANY
foot of Kimball Street
Haverhill

Haverhill
19.331000.473675

The Haverhill Paper Company was established in 1883 with a capital of \$50,000 and began to manufacture newspaper from wood pulp. The company began a period of rapid expansion around 1890, and by 1910 several large 1 and 2 story brick buildings had been erected. Most of these buildings have been altered so as to be almost unrecognizable. The old boiler house was replaced by a modern heating plant around 1960. The best preserved structure on the site is the 1902 two story brick office building. Today the company manufactures paperboard from recycled paper.
(Haverhill, Massachusetts (Haverhill, 1889); Stone)

Manufacturing Industries

GILMAN HAT COMPANY
Laurel Street near Railroad Avenue
Haverhill

Haverhill
19.329000.473688

The J. P. Gilman's Sons Hat Factory was established around 1880 and prospered until 1902, when the firm's name became the Emmons Hat Company. The Emmons Co. employed 400 workers and had 18 sets of cards. In 1926 a change of ownership took place, and the firm's new name became Bradford Hat Company. The size of the company remained unchanged. In 1934 the company went bankrupt and in 1936 the mills were again activated. Until 1934 the product had always been men's, women's and children's hats. The new firm, the Wagner Company, installed 40 sets of cards, removed the stitching and dyeing machinery, and produced only hat bodies. In 1947 operations were liquidated for the last time, and the buildings were taken over by the Ornsteen Heel Company. The main mill dates from 1880, and is two stories high with a basement and attic. It has a pitch roof, and is 75' x 25'. An addition on the river side of the mill was made about 1900, and is similar to the main mill. A third addition, 75' x 40', with two stories, was made around 1910.

(Atlas of Essex County, 1884; Haverhill, Massachusetts (Haverhill, 1889); Map of Haverhill, 1892, MVTM; Textile Blue Books, 1900-1948; Stone)

W. B. THOM HAT COMPANY
270 River Street
Haverhill

Haverhill
19.328670.473688

The W. B. Thom Hat Company was probably organized during the 1860s in Ayer Village, when the demands of the Union Army made ideal conditions for hat making. In 1874 the company built new wood mill buildings on the present site on River Street. In 1889 the

Thom Co. was the largest in Haverhill, with a capacity of almost 5,000 hats per day. The firm made wool and fur hats for men, women and children, and employed about 500 hands. Around 1920 the company went out of business, and the buildings were purchased by the Karelis Shoe Company and later the Allen Shoe Company. Only two of the original six buildings remain. These are a brick, three story mill, about 1900, with a flat roof with a monitor, 35' x 120', and a 40' x 30' brick single story boiler house, without the stack. The mill building, which lacks a stair tower, has a stone name plate with the legend "Thom's Building."

(Haverhill, Massachusetts (Haverhill, 1889); Haverhill City Atlas, 1875; Haverhill City Directories, 1905, 1923)

KNIPE SHOE COMPANY
Oxford Street
Haverhill

South Groveland
19.327200.473460

The Knipe Shoe Company was established in 1890 as a manufactory of men's rubber soled shoes and has remained in use as a shoe factory until the present day, although under different owners. The main mill is a wooden shingled 3 story structure, ca. 1890, 250' x 40', with a shallow pitch roof and separate stair-water tower. Of its outbuildings, the most important are a wooden single story hip roofed machine shop and a handsome single story hip roofed boiler house constructed of uncoursed granite rubble.

(Haverhill City Directories, 1890-1950)

SANDERS LEATHER COMPANY
134 Washington Street
Haverhill

Haverhill
19.329330.473746

The Sanders Leather Company was established in 1870 as a supplier of cut soles for the dozens of shoe factories on Washington and Merrimack Streets. The company continued operations until the 1950s under a number of owners, but has been used for storage since about 1955. The building is identical in design to the shoe companies of the Washington St. district. It has an elaborate Italianate facade and the first floor facing the street has a highly styled store front of glass. It is brick, 25' x 150', with a flat roof. Unlike the shoe companies, the Sanders Co. added a boiler-engine house around 1883.

(Haverhill, Massachusetts (Haverhill, 1889).)

SPAULDING SHOE COMPANY
417 River Street
Haverhill

Haverhill
19.328280.473670

The Spaulding Shoe Company was organized in 1890, and was one of the larger shoe companies in Haverhill. The mill buildings, which are on both sides of River St. and which extend to Vila St., date from the period 1890-1920. Most interesting is the building at the corner of River St. and Vila St. It is a brick five story structure the floors of which have clearance of 7 feet or less. This contrasts with the 8-12 foot ceilings of textile mills of the same period. The Spaulding building also lacks an outside stair-water tower. The loading doors on the River St. side have massive



The Sanders Leather Company, Haverhill, Massachusetts, 1889
(Haverhill, Massachusetts)

semi-circular arches, each with six rows of brick headers arranged in a rowlock bond.

WASHINGTON STREET SHOE DISTRICT

Washington Street from Railroad Bridge to Washington Square
Haverhill

Haverhill

19.329440.473750

This section of Washington St. contained almost sixty of the more than 100 shoe factories which were located in Haverhill by 1890. The remaining shoe companies were located within a few hundred feet of this central district. The average factory unit was a three or four story brick building, although a few were of wood. The buildings were rarely more than 25 feet wide and 50 feet long. Most have elaborate Italianate facades. None of these buildings were equipped with power machinery until the 1890s, when they were wired for DC electricity from the Haverhill Electric Power Company, which was built nearby in 1888. Many of these buildings have datestones and the names of the shoe companies. After 1890 new construction followed the general lines of textile mills, i.e. multistory brick or concrete buildings equipped with steam or water power.

(Haverhill, Massachusetts (Haverhill, 1889).)

Transportation

BOSTON AND MAINE PASSENGER STATION
Lowell Street near Railroad Avenue
Haverhill

Haverhill
19.329200.473694

A passenger station of the same dimensions as this structure appears in an 1884 Atlas of Essex County. The station is a one story wood structure with a loft covered by a hip roof which overhangs the station by about 4 feet. This overhang is supported by attractive wood brackets. The overall dimensions of the building are 35' in length and 15' in width.

(Atlas of Essex County, 1884; map of Haverhill and Bradford, 1892, both MVTM)

Bridges

BASILIER BRIDGE

connects Main and South Main Streets across Merrimack River
Haverhill

Haverhill
19.330100.473758

The Basilier Bridge, known until 1970 as the Lower County Bridge, is a reinforced concrete open spandrel arch bridge with a single leaf bascule draw in the center span. The bridge was completed in 1924, with George Swain as the consulting engineer. The bridge has 5 segmental arches with spans of 120' and rises of 20', and one segmental arch in the south side of the bridge with a span of 75'. The draw leaf is in the center span. Two handsome control towers with copper turret-like roofs remain intact, although they contain no machinery. The draw mechanism was never installed, since the plan to make the Merrimack River navigable from Newburyport to Lowell never was implemented. Each arch is articulated into three rings, probably to save weight. The total length of the bridge is 1,000 feet, with a width of 50 feet.

(Haverhill City Engineer's Office)

COUNTY BRIDGE

South of intersection of Washington, Merrimack and
Haverhill Water Streets

Haverhill
19.329220.473722

This through, pin connected, plate and lattice girder, inclined chord, Pratt truss bridge was designed by George Swain and constructed in 1906 by the American Bridge Company of New York City. There are 5 spans, each of 170 feet. Each span has 5 full panels and two end panels. The upper chord members are plate girders and the lower chord consists of parallel steel or wrought iron bars. The verticals are lattice girders and the diagonals are parallel steel or wrought iron bars. All members are connected by pins. The upper lateral system consists of double diagonal horizontal braces and a series of double intersection Warren truss vertical bracings. The lower lateral system uses plate girder girts which are 4 feet in depth and I-beam stringers. The deck itself is a steel mesh. The cutwater piers are constructed of dressed granite blocks, as are the pier style abutments. On the Haverhill (north) side of the river Swain omitted a sixth trussed span by employing plate girder beams, 4 feet in depth, with girts of the same size. The span of this section of the bridge is approximately 50 feet. This arrangement was probably used because three major roads intersect

very near the bridge and an obstruction-free approach to the bridge is necessary.
A truss would have provided such an obstruction.
(Haverhill City Engineer's Office)

BOSTON AND MAINE RAILROAD BRIDGE
near Upper County Bridge
Haverhill

Haverhill
19.329280.473725

This skewed, riveted construction, plate girder, combination deck and through Warren truss railroad bridge was built in 1920, replacing an earlier railroad bridge. It has 5 spans, each 180 feet in length. It has 4 deck spans and one through span over the channel of the river. The piers are of the cutwater variety, with granite blocks set in a flemish bond. The wing abutments are constructed of granite blocks.
(Boston and Maine Railroad, Iron Horse Park, Billerica, MA)

LAWRENCE

Bulk Products Industries

COLD SPRING BREWERY
675 South Union Street
Lawrence

Lawrence
19.323560.472796

The Cold Spring Brewery was organized in 1890 by E. A. Dick and A. Steighler, and manufactured lager beer and ale. The company prospered until the prohibition era, when it was converted to a soft drink factory. Since the 1950s it has been used as a warehouse. The original three story brick building and boiler house are still standing, although in a deteriorated state.
(Lawrence Up-To-Date, 1845-1895)

ARLINGTON COTTON MILLS
off Broadway
Lawrence

Lawrence
19.321180.473160

The Arlington Mills constructed a cotton mill near its worsted mills in order to manufacture fine cotton yarns which were previously made only in Europe. Mill No. 1 was completed in 1881. It is a 3 story brick building with a castellated water tower. Mill No. 2, completed in 1886, is similar in size and architectural style. These mills may have been built by Lockwood-Greene Engineers of Boston, builders of many of the other Arlington buildings. Power was by steam, and 3 engines produced about 1400 HP. The power house was razed in 1906 when the large power house near the worsted mills was built. By 1925 there were almost 20 buildings as part of the cotton mill complex, which became a separate corporation of the Arlington Mills in 1917. The corporation was now known as the Acadia Mills. Its capacity was about 100,000 spindles. The mill had no looms. It either sent its yarn to the worsted mills or spun yarn on commission for other cotton mills.

(Arlington Mills, 1865-1925 (Boston, 1925); Barlow, No. 6601; Harding, Whitman and Co. (Boston, 1902).)

EVERETT MILLS
Union, Canal and Garden Streets
Lawrence

Lawrence
19.323620.473040

The Everett Cotton Mills were organized in 1860 by Samuel Batchelder, the treasurer of the Hamilton Mfg. Co. in Lowell and the York Mfg. Co. of York, Maine. The company occupied the buildings of the Lawrence Machine Shop, which are described on a separate inventory card. The Everett Mills manufactured gingham and denims. The company prospered until 1929, when it suspended operations and was rented to a number of small companies. Exclusive of the Machine Shop buildings, the company erected a weave shed of 2 stories and an attic with a pitch roof. The southern side of this roof contains clerestory monitor windows. The northern side contains dormers. The building is brick and was built in 1863. The mill faces Canal Street. In 1892 an additional brick mill was completed, 4 stories in height, with a shallow pitch roof, with pilaster style walls. The mill is 237' x 107', with a combination stair-water tower. The building is archtypical of the fire-resistant mills advocated by the insurance companies of the 1880s and 90s. A storehouse was completed around 1905, brick, 150' x 50', seven stories high, with load bearing walls at 50 foot intervals. This building borders the Spicket River. The last mill to be constructed faces on Union Street, and is of monumental size, being six stories high, brick, 650' x 75', with deep pilaster style walls with hot air flues in the rear of the mill. Next to the mill, at the corner of Union and Canal Street, stands the Pemberton Company's storehouse. Although deriving some power from the water turbines of the former Lawrence Machine Shop, the Everett Mills also used steam power, and around 1900 a large boiler and engine house was erected. This complex was largely replaced with a new boiler house around 1960.

(FM, No. 2855; HHEC; Stone)

LAWRENCE DUCK COMPANY
Union and Canal Streets
Lawrence

Lawrence
19.323560.473020

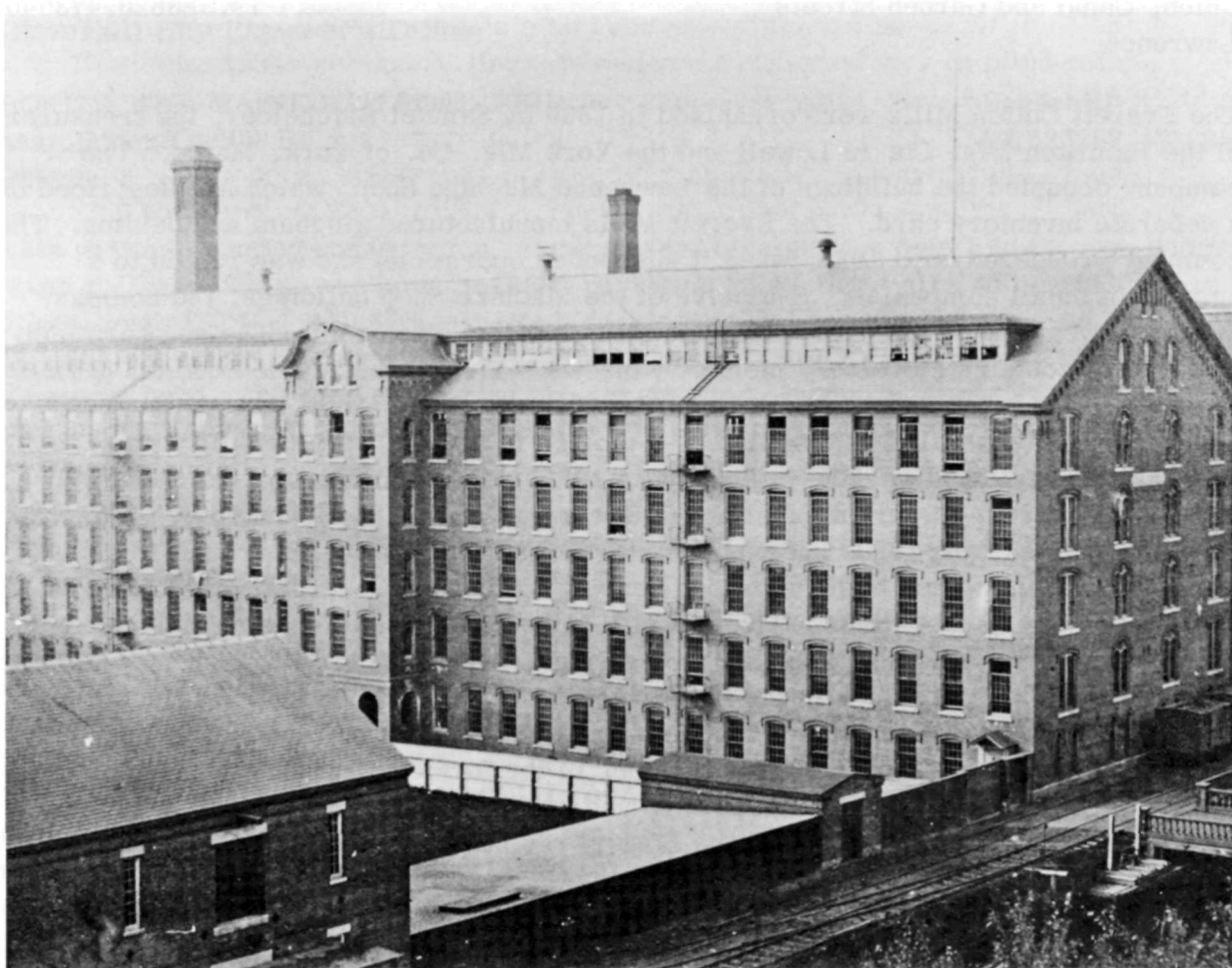
The Lawrence Duck Company was the smallest of the original mills at Lawrence. It was completed in 1853 under the direction of Isaac Thatcher, who ran the company until the 1880s. It manufactured cotton duck cloth for sails and tents, and sail twine, and was quite successful until the depression of the 1930s caused it to suspend operations. The lower two stories of the brick, 200' x 40' mill are still in existence. The remaining floors were added in a renovation in 1906 under the direction of the Charles T. Main Co. of Boston.

(HHEC; MVTM; Stone)

PEMBERTON MILL
North Canal Mill Island between Union and Newbury Streets
Lawrence

Lawrence
19.323500.473020

The present Pemberton mill was built on the site of the 1853 Pemberton mill, which collapsed because of faulty cast iron columns in January of 1860. The new mill was



Pemberton Mill, Lawrence, Massachusetts, ca. 1890
(MVTM Collections)

designed by Theodore Voelkers, a German trained architect who also designed the town hall in Andover. Although the Pemberton manufactured some woolen cloth during the Civil War, the structure was used as a cotton mill until after World War II, when the building was leased to a number of small industries. The main mill is a brick 5 story structure with a basement and attic. The roof of the mill has a trapdoor monitor, and the stair towers have gambrel roofs. The windows and corbelling are quite ornate, reflecting a mixture of Italianate, Romanesque and Second Empire styles. The flooring system of the mill follows the standard practice of the day, and is fire resistant with wooden columns. The Pemberton was powered by water turbines, drawing water from the North Canal. The three 39-inch vertical Hercules turbines installed in 1891 are still in place. During the late 19th and early 20th centuries picker, dye and store houses were erected to the south of the main mill. These buildings are no longer standing.

(HABS, 1968; HHEC; MSS-MVTM; Stone)

UPPER PACIFIC MILLS

Canal Street from Broadway to Amesbury Street
Lawrence

Lawrence

19.322700.472996

The Upper Pacific Mills were the largest of the original mills in Lawrence, being incorporated in 1853 and financed and managed by Abbott Lawrence, the owner of several mills in Lowell and the most important stockholder in the Essex Company. The main mill of the Upper Pacific, which was razed around 1960, was 850 feet long and 75 feet wide. In addition to the main mill, there were about a dozen smaller buildings for the bleaching, dyeing, and printing departments, as well as a machine shop and a boiler-engine house. The Pacific was primarily a cotton mill, but some worsted yarn was also manufactured as early as 1855. In 1890 the capacity of the Upper Pacific was 150,000 spindles, 4,600 looms, and 25 printing machines. Power was by means of water (80%) and steam (20%). The Upper Pacific was closed in 1955. The surviving buildings of this complex include parts of the two stone wheelhouses, the turbines of which are still in use, 3 storehouses, 2 weave sheds along the canal, a boiler house and octagonal stack built in 1873, and a massive 6 story, 300' x 75' weaving mill (1916).

(Barlow, No. 4708; HHEC; Stone)

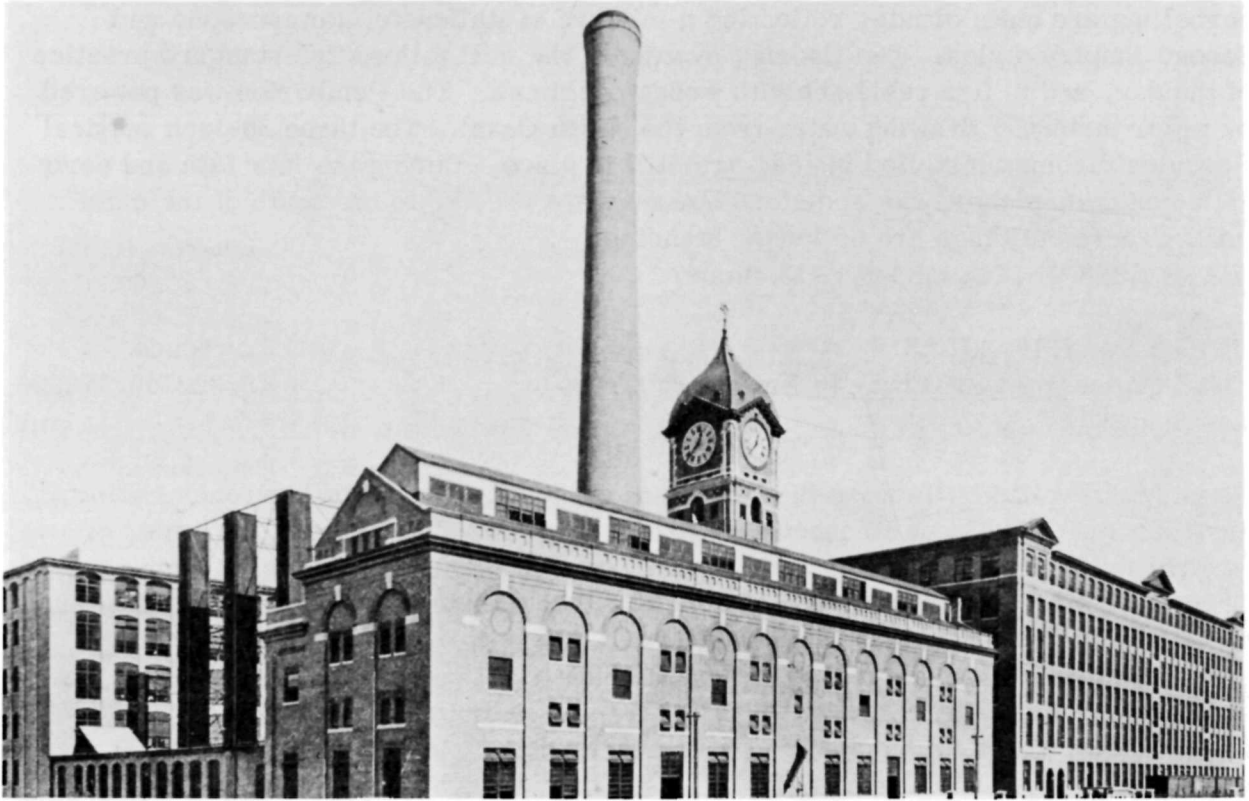
ARLINGTON MILLS

Broadway
Lawrence

Lawrence

19.321660.473136

The Arlington Mills began with the installation of woolen machinery in a building dating from about 1834. During the 1870s the mill switched to worsteds of very high quality, and a four storied Gothic style wooden mill was completed in 1867. This building was demolished around 1880 to make way for a large brick structure. A saw-tooth roofed weave shed was also built. The new buildings were standard late 19th century styles, with pilaster walls and flat roofs, and included water towers, forced draft heating, and sprinkler systems. In 1891 there were over a dozen large structures, with 2 boiler houses and eight steam engines with a capacity of 4500 HP. All power was by means of steam. In 1882 the mill had both arc and incandescent lights, powered by 4 generators. By 1892 there were 724 arc lights and 2,000 incandescents. The mill had tele-



Ayer Mill, Lawrence, Massachusetts, 1912
(Charles T. Main Company brochure)

phones in 1890 which connected all mill buildings as well as the offices in New York and Boston. In 1896 a mill was built for the manufacture of worsted tops, the first in the United States. A new power house was built in 1906 which replaced the two older houses and which generated 22 MW by means of turbine powered generators. In 1925 a large spinning mill was built, and no additional buildings have been constructed since. In 1925 the mill complex contained 132,000 spindles and 2,600 looms, and was one of the largest worsted mills in the world. The designer for many of the buildings was the Lockwood Greene Co. of Boston.

(Arlington Mills (Boston, 1925); Arlington Mills, a Historical and Descriptive Sketch (Boston, 1891); Barlow, Nos. 3269 and 4245; FM Nos. 5587, 7909, 9493, 13618; original drawings - Lockwood Greene Engineers, N.Y., N.Y.)

AYER MILLS

South Union and Merrimack Streets
Lawrence

Lawrence

19.323540.472988

The Ayer Mills were designed by Charles T. Main Architects and built for the American Woolen Company as that firm's third worsted mill in the city of Lawrence. The mill was named for Frederick Ayer, a Lowell patent medicine manufacturer and the father-in-law of William Wood, the President of the American Woolen Co. The Ayer Mill manufactured worsted suitings and every operation in worsted manufacture was accomplished within its two mill buildings and dyehouse. An underground tunnel connected the Ayer to the Wood Mill, which was situated within 200 feet of the Ayer. During the 1950s the American Woolen Company ceased operations, and the Ayer Mill was tenanted to a number of small concerns. The dyehouse and boiler-turbine house were destroyed to create a parking lot. The boiler-turbine house contained eight 600 HP boilers and two 2.5 MW turbo-generators. The dyehouse was 2 stories, brick, 90'x126'. Of the two remaining mill buildings No. 1 is brick, 6 stories in height, 123'x595'; No. 2 is 7 stories, brick, 123'x329'. The 2 mills are connected at the east end by an 8 story building, 40'x81', which contains water closets and stairways. Another building, 40'x81', connects the west ends of mills 1 and 2. This building was used as a stair and elevator tower. Above the roof level of this building rises a 40'x40' brick tower, the weather vane of which is 267' above street level. In the tower was a 20,000 gallon water cistern, a bell, and a clock with 4 illuminated dials each 22'6" in diameter. The buildings were decorated with elaborate facades in a neo-georgian style, with pediments, granite coursings, and palladian windows. The buildings are among the most highly styled 20th century mills in the United States. In 1910, the mill's first year of operation, it contained 75 worsted cards, 80 combs, 45,000 spindles, and 320 broadlooms. It employed over 1,000 workers. Although situated near the Essex Company's South Canal, the Ayer did not utilize water turbines, but it did use water from the canal for process and boiler water.

(Charles T. Main Co. trade catalogues and drawings; Stone; MSS-MVTM)

CENTRAL PACIFIC MILLS
300 Canal Street
Lawrence

Lawrence
19.323040.473016

The Central Pacific Mills were built in 1864 as an extension of the Pacific Mills, the largest of the original textile mills in Lawrence. The Central Pacific was primarily a worsted mill, and was among the earliest of American companies to install power driven jacquard looms. The 1864 mill with its 17 foot high ceilings, was designed to accommodate the looms. Originally 2 stories high, the mill had the unusual width of 150 feet, being 350 feet long. It had a flat roof with a monitor. Between 1865 and 1877 two stories were added to the building. The mansard roofs on the twin stair-water cistern towers have been removed. The length of the building was increased by 150 feet in 1908. To the west of this mill is the 1885 engine house and octagonal chimney, the first industrial buildings to be designed by the mill architect Charles Main. Three of the mill's water turbines, dating from the years 1914-1923, are still used to generate electricity.

(Standard History of Essex County (Boston, 1879); Barlow No. 4709; Charles T. Main, Notes on Mill Construction (Boston, 1886); MSS-MVTM)

GEORGE E. KUNHARDT CORPORATION
Union and Island Streets
Lawrence

Lawrence
19.323640.472920

The Lawrence Woolen Mill was built on this site in 1864 under the direction of Captain Oliver H. Perry, son of the War of 1812 naval hero and himself a hero of the Mexican War. Perry ran the woolen mill, which had 3,000 spindles and 50 looms, until his death in 1878. In 1886 the company was purchased by Messrs. Phillips and Kunhardt, and in 1895 Kunhardt obtained complete control of the mill. He introduced worsted machinery in the 1890s and by 1910 about 80% of the company's output was worsted cloth. Between 1890 and 1920 Kunhardt removed all of the old buildings and built several new mills. In 1920 the mill had 22 sets of cards, 288 broadlooms, 14,000 spindles, and employed 900 workers. The mill went bankrupt during the 1930s. (HHEC; MSS-MVTM; Stone)

MONOMAC SPINNING COMPANY
South Union and Grafton Streets
Lawrence

Lawrence
19.323370.472852

The Monomac Spinning Company was organized in 1911 by the William Whitman Co., controlling corporation for the Arlington and Acadia Mills in Lawrence, and the Bay State Weaving Co. in Lowell. The Monomac was strictly a spinning mill, producing worsted yarn spun on the French system. In 1928 the mills contained 102,000 spindles. The company suspended operations in the 1950s and the buildings were purchased by the Western Electric Company. The 1911 spinning mill, 300' x 100', the 40' x 50' storehouse, and the 75' x 100' boiler-turbine house are intact, although several of the other buildings have been razed to create parking space. (Stone)

PROSPECT MILL
Merrimack Street, 150 meters west of Central Bridge
Lawrence

Lawrence
19.322900.472974

The Prospect Mill building was erected in 1872 by Frederick Butler and Samuel Robinson, manufacturers of worsted yarn. This company was absorbed by the American Woolen Company in 1907 and remained in use as a yarn mill. In 1928 the mill contained 11,000 spindles. The building is brick with a pitch roof, 60' x 30', three stories high. It is at present part of the Merrimac Paper Co.

(HHEC)

WASHINGTON MILLS
opposite Canal Street
Lawrence

Lawrence
19.323380.473020

The Washington Mills were built by the Lockwood-Greene Co. in 1886-87 on the site of the Bay State Woolen Mills, the first mills built in Lawrence. Only a small fragment of one of the 1848 outbuildings remains, and it has been heavily modified. The Washington Mills, which included 6 main buildings in 1890, were the largest woolen mills in the United States until the 1890s, when the entire production was shifted to the manufacture of worsteds. The mills are all of standard late 19th century construction, consisting of brick multi-story, flat-roofed, rectangular buildings. The Washington Mills were absorbed into the American Woolen Co. in 1899, and remained so until the dissolution of that company in the 1950s, when the buildings were left vacant. Today they are used for warehouses and small industries. The store house, on the north side of the canal, and a reinforced concrete and brick mill, were built by Chas. T. Main in the years 1909-1925. Machinery was powered by means of water turbines and steam engines. The turbines, double horizontal reaction wheels, are still in place. One set is still in use. The steam engines are gone but the stack, which is almost 300 feet tall, is still in place.

(A Sketch of the Mills of the American Woolen Company (Boston, 1901); Barlow, Nos. 3795, 9362; FM, No. 1130; Chas. T. Main Co., Boston; Lockwood-Greene Engineers, N. Y., N. Y.; MSS-MVTM)

WOOD MILLS
South Union and Merrimack Streets
Lawrence

Lawrence
19.323840.472986

The Wood Mill was built during 1906 as the largest mill complex in the huge American Woolen Company, which owned over 30 mills at the time. The new mill was named for the Company's president, William M. Wood. It was the largest worsted mill in the world. The complex consisted of 2 main mills connected at South Union Street by an office building, as well as a storehouse, dyehouse, boiler house, engine house, and filter gallery. During the 1950s the American Woolen Company suspended operations, and the buildings were tenanted. One of the main mills and the dyehouse were destroyed to create parking space. The remaining main mill is 5 stories high plus a basement, brick, with pilaster style walls. Buttress-like brick flues were built on the north side of this mill to conduct hot air to the individual floors of the mill. The mill is 1,380 feet long and 130 feet in width. It has a monitor roof. The other main mill, the site of

which is due north of this mill, was identical in size. The storehouse is brick, 130' x 500', and 7 stories high with a basement. It has load bearing fire walls at 50 foot intervals. The small, widely spaced windows of the storehouse increased the strength of the walls. The floors of the storehouse were designed to handle 400 lbs. to a sq. ft. The boiler house is a brick structure, one story with a basement, 350' x 125'. It initially held 20 vertical boilers, each of 300 HP, but during the 1920s these boilers were replaced by 24 more powerful units, each developing 600 HP. The attached engine house is also brick, one story plus a basement, 130' x 65'. Initially it housed 2 steam engines and 2 GE AC generators. One of these steam engines developed 8000 HP, with 4 high pressure cylinders, each 33" x 68", with a 4-foot stroke. The steam pressure was 160 lbs. per sq. ft., and the flywheel rotated at 120 RPM. Further details on this engine are unavailable. There is no information on the smaller engine, but it probably developed over 1000 HP. During the 1920s these engines were replaced with turbines and new generators of unknown make or description. They were probably similar to those installed at the Ayer Mill, each of which developed 2.5 MW. Six of these turbo generators were installed, so they probably developed some 15 MW. The Wood Mill was designed by Charles Main, mill architects of Boston and built by McIntosh Seymour and Co. of Auburn, N. Y. The design engineers for the power plant in 1906 were George H. Diman and Frank S. Allen. During its peak years of operation, the Wood Mill housed 160 sets of woolen and worsted cards, 146 combs, 225,000 spindles, and 1,500 broad-loom.

(Lawrence Tribune, 26 March 1906; MVTM; Charles T. Main, Boston; Stone)

FARWELL BLEACHERY
39 South Canal Street
Lawrence

Lawrence
19.323040.472976

The Farwell Bleachery was begun in 1878 by Nathaniel Farwell and his son John. Nathaniel Farwell had acquired his skills as a bleacher and dyer in the Boston Manufacturing Co. of Waltham, Mass. He built and operated large bleacheries and dye works in Great Falls, N. H. (1850), Passaic, N. J. (ca. 1855), and Lewiston, Me. (1860). Farwell also operated several cotton mills in Maine. In 1877 Farwell constructed his last bleachery on the mill island of the South Canal in Lawrence. In 1895 the 3 original mills were supplemented by the purchases of the Essex Company's Union Mill (1872), which had been built as a tenant mill by the Essex Company, but which was primarily operated as a twine and fish line company. By 1914 new construction had added six additional buildings to the Farwell complex, but the city of Lawrence razed about one quarter of the entire plant in order to create space for the Central Bridge. The Bleachery continued to operate until after World War II, when the buildings were tenanted by a number of small companies. The 3 original buildings, dating from 1877, still survive. These buildings occupy the corner of South Canal St. where it intersects the Central Bridge. The Union Mill is masked from sight by a storehouse. Access to the buildings of the complex is difficult by virtue of the fact that the structures have been built one against the other without alleyways or yards. Most of the buildings are 1 or 2 stories in height, since multi-story buildings were not suitable to the installation of bleaching and dyeing equipment. The bleachery was powered entirely by water, but a boiler house was erected in 1877 to supply steam for processing and heating. (FM; Lockwood-Greene records in MVTM; HHEC; J. D. Van Slyck, New England Textile Manufacturers (Boston, 1879), vol. 1)

PACIFIC PRINT WORKS
360 Merrimack Street
Lawrence

Lawrence
19.324850.472996

The Pacific Print Works were completed in 1911 as a replacement for older print works which were owned by the massive Pacific Mills Corporation in Dover, N. H., Lowell, and Lawrence. The mills and power plant were designed by Lockwood-Greene Engineers of Boston. In addition to textile printing, dyeing and bleaching were also performed on very large scales. The Print Works continued in operation until the 1950s, when the assets of the Pacific Mills were liquidated. The buildings have been tenanted ever since. All of the major buildings are still standing, although some have been deserted. These are the boiler-turbine houses, the finishing building (on Merrimack St.), the printing building (on the river bank), and the main mill (dyeing, bleaching, printing), which is located between the printing and finishing buildings. There is also the storehouse. Most of these buildings are 3 and 4 stories high, with the exception of the storehouse, which is 7 stories high. The height from ceiling to floor of most of these buildings is higher than usual, in order to accommodate the tall finishing equipment. The dimensions of the buildings are impressive; the finishing building is 1,250' x 120', the print building is 1,600' x 120', and the main building consists of 2 wings, each 750' x 250'. In 1928 the print works had the capacity to finish 6.5 million yards of cloth per week, with 51 printing machines and 80 bleaching kiers. The storehouse is brick, standard storehouse construction, with load bearing walls at 50 foot intervals. The dimensions of the 7 story building are 300' x 120'. The boiler-turbine house is a single story brick building 250' x 125'. It contained 28 boilers, each developing about 600 HP, and had 8 turbo-generators capable of generating 20 MW. Only 4 of these boilers remain in place, and all turbo-generating equipment has been removed.

(Samuel B. Lincoln, Lockwood Greene(Brattleboro, Vt., 1960); Lockwood Greene Co., N.Y., N.Y.; MVTM; Stone)

USWOCO DYEING PLANT
Merrimack Street, 100 meters west of Casey Bridge
Lawrence

Lawrence
19.322940.472976

The U. S. Worsted Company dyeing plant was built during the years 1915-1920 to handle the dyeing and finishing operations of the main mill, which was located at the western end of the South Canal Island, but which was razed in 1965. The buildings of the dyeing and finishing plant are 1 and 2 story brick structures of standard design. The boiler house, with its round 125 foot high chimney, has survived.
(Stone)

E. FRANK LEWIS COMPANY
Merrimack Street east of Central Bridge
Lawrence

Lawrence
19.323160.472980

E. Frank Lewis erected a wool scouring plant on the mill island of the South Canal in 1890. By 1895 the company included one 3 story brick carbonising mill,

150' x 40', and several large wooden scouring mills and storehouses. The company continued in operation until the 1950s, although it lost about a third of its mill site to the Central Bridge in 1918. The carbonising mill still exists as the location of several small companies.

(Lawrence-Up-To-Date, 1895)

BACON PAPER COMPANY
Marston Street near High Street
Lawrence

Lawrence
19.324250.473024

The site of the Bacon Paper Company was originally the location of the Lawrence Paper Company, established in 1855. In 1863 Jerome Bacon bought and enlarged these buildings, and manufactured newspaper and book paper, probably using wood pulp. In 1913 the company ceased operations and the buildings were purchased by Milton Einstein, who manufactured woolen rugs under the name of the Plymouth Mills Corporation. Einstein razed all of the original buildings during the next six years and replaced them with 3 and 4 story brick structures. He also rebuilt the penstocks and wheelpits and installed 2 new Hercules Class B 30-inch horizontal turbines, which are still in place. (Lawrence Gazette, 1894; Insurance Survey, MVTM; MSS-MVTM; HHEC)

MERRIMAC PAPER COMPANY
South Canal Street
Lawrence

Lawrence
19.322820.472968

This paper company is the oldest surviving structure on the South Canal; the first structure on the Canal, a flour company, burned in 1907. The company, which was founded by J. S. Munroe, manufactured white, manila and dry roofing paper, using stock of rags, paper, and jute. In 1872 the company employed 130 men and owned two Fourdrinier machines. During the 1870s, Munroe had financial difficulties, and in 1881 he sold the entire plant to a group of new investors from Holyoke and Springfield, who renamed the firm the Merrimac Paper Company. The product continued to be manila and white paper, and the production was about 11 tons per day. By 1929 the company included 8 Fourdrinier machines and produced 24 tons per day of book and magazine paper, as well as coated lithograph and other special papers. It is not known when the company shifted from rag to wood pulp stock. The company has continued in operation to the present day. The size of paper making machinery plus the wet process involved in paper making necessitated mill buildings of 1 or 2 stories at most. The 2 main buildings of the Merrimac Paper Company fit this pattern. The office building and storehouse (1870), which is parallel to the canal, is two stories high with a basement and attic. It has a pitch roof which is supported by queenrod trusses. The main mill is perpendicular to the canal, one story plus a basement, 210' x 50'. The pillars in the basement are quite unusual, consisting of a series of brick semi-circular arches and piers, as well as a series of stone piers and brick segmental arches. This precaution was probably taken in view of the heavy weight of the machinery on the floor above. A few minor additions have been made to these 2 buildings, and many windows have been bricked in, but the 2 original structures are essentially intact. The mill was originally powered entirely by water, and continues to operate two modern Allis-Chalmers turbines. Around 1900 a boiler house was added. (Insurance Survey, MVTM; Lawrence City Atlas, 1875, 1896, 1906, 1926; MSS-MVTM; Standard History of Essex County (Boston, 1878); Stone)

RUSSELL PAPER COMPANY
Marston and Canal Streets
Lawrence

Lawrence
19.324090.473034

This small stone storehouse, dating from about 1853, is all that remains intact of the once sprawling Russell Paper Company. William Russell and his son William A. Russell were among the earliest papermakers to employ wood pulp in their mills. Russell began operations in Lawrence in 1853 and expanded to the property east of the Everett Mills as well as along the east bank of the Spicket River. The Russell Co. was absorbed by Champion International in 1900, and the paper mills continued in operation until the 1950s. The buildings were destroyed by fire in 1973 and the site is now used as parking space for an expanding Lawrence General Hospital (Insurance Survey, No. 11, MVTM; HHEC; Stone)

Manufacturing Industries

LAWRENCE MACHINE SHOP
Everett Millyard, east of 1909 mill
Lawrence

Lawrence
19.323700.473040

The Lawrence Machine Shop was begun in 1846 and completed in 1848 by the Essex Company, builder of the dam and canals in Lawrence, and original owners of all the land in Lawrence. The Shop was designed by the Essex Company's chief engineer, Charles Bigelow, a graduate of the United States Military Academy and former member of the Army Corps of Engineers. With its machine shop, forge shop, foundry, round house, pattern houses, and smaller outbuildings, the Lawrence Machine Shop was capable of making everything from cotton machinery to locomotives, and did so. An 1855 trade catalogue advertises the sale of steam engines, water turbines, textile machinery of all types, machine tools, and locomotives, to name only the major items of manufacture. The competition of other shops in New England, together with the clouded financial period of the late 1850s, caused the owners of the shop to cease operations in 1857. In 1860 the entire plant was sold to the Everett Mills Corporation for the manufacture of cotton cloth. The buildings remained a part of that corporation until its dissolution in 1929, when they passed under the control of the Everett Mills Properties of New York City. The buildings have been tenanted ever since. All of the buildings of the Lawrence Machine Shop were constructed of granite rubble, probably excess stone from the construction of the dam. The machine shop was the largest building, being 4 stories high, with a steeply pitched roof, in which skylights were set. The shop had 6 stair towers, of which the center two were used to store water. The dimensions of the building are 405' x 65'. The mill has attractive globe windows in the attic at either end, as well as in the central stair-water tower. The columns used to support the floor were cast iron, as were those used in such other Bigelow-designed mills as the first Pemberton, Atlantic, Duck, and Upper Pacific. This building remains essentially unchanged. To the east of the machine shop, and perpendicular to it, lies the forge shop, which is two stories high, 43' x 225', with a pitch roof. The foundry also survived, although it has been modified by the addition of extra stories. It is L-shaped, and extends from the north west end of the forge shop. Attached to the foundry is the boiler house, with its circular chimney, approximately 125 feet in

height, and constructed entirely of granite blocks, a rarity in New England. In addition to steam power of unknown capabilities, the Lawrence Machine Shop was supplied with water from the North Canal, which entered the wheelpits in the center of the main machine shop (2 Boyden wheels) and the eastern end of the forge shop (1 Boyden wheel). All 3 wheels discharged their water into a stone tailrace which discharged into the Spicket River. In 1920-21, 3 Hercules type D vertical turbines, with umbrella generators, were installed in the original wheelpits. These turbines are still in operation. (FM, No. 2855; HHEC; MSS-MVTM; Standard History of Essex County (Boston, 1879).)

STANLEY MANUFACTURING COMPANY
West and Haverhill Streets
Lawrence

Lawrence
19.322000.473040

The Stanley Manufacturing Company was organized in 1882, occupying the buildings of the Gordon McKay Sewing Machine Company. The new company continued to make McKay sewing machines as well as heeling, lasting, and other shoe machinery. In 1920 the buildings were taken over by the A. G. Walton Shoe Company. Only two of the original 6 mill buildings survive. The oldest of these buildings was erected around 1875, while the other building was constructed around 1890. (HHEC; Stone)

J. H. HORNE AND SONS
109 Blanchard Street
Lawrence

Lawrence
19.323000.472900

J. H. Horne, a self-educated blacksmith and machinist who arrived in Lawrence in 1845, age 18, in order to work on the Great Stone Dam, began to make paper machinery in 1863 in Medfield, but in 1871 he moved his business to Lawrence. The business expanded, and in 1887 he moved to the company's present location on Andover and Blanchard Streets. The plant has been extended to the present day. In 1887 the company manufactured Fourdrinier machines, washing and beating machines, Jordan refining engines, calender rolls, and similar equipment. The company remains in operation today. The main building is brick, single story, with a monitor roof. In 1887 it was 64' x 300' but an extension in 1892 increased the building's size to 410' x 64'. A single story brick foundry, 75' x 50', was added around 1900. This foundry has been expanded, and many frame outbuildings have been added as well. (Lawrence Atlas, 1896, 1906, 1926; Lawrence Up To Date (Lawrence, 1895); Stone)

EMMONS LOOM HARNESS COMPANY
7 May Street
Lawrence

Lawrence
19.321780.473038

T. A. Emmons began his loom harness manufacturing on this site in 1868, but the oldest surviving building is the 1896 brick 3 story structure, 100' x 40', which faces on May St. An addition to this building was made in 1910, and the boiler house dates from about 1900. The 1896 building has an elaborate facade, including a double row of corbelling, granite courses, a copper portal over the entrance way, and an ornate wrought iron grill over the door itself. The hip-roofed water tower originally was equipped with a clock, but it is now bricked over. The buildings have been tenanted since about 1960. (Stone)

L. SPRAGUE SHUTTLE COMPANY
275 Lowell Street
Lawrence

Lawrence
19.322160.473028

Levi Sprague established his shuttle manufacturing plant in 1864 in a small wooden building at this location. Around 1874 he constructed a 2 story L-shaped brick building, 100' x 42', on the site of the wooden building. This building was extended by 120 feet in 1890. Sprague was bought out by the U. S. Bobbin and Shuttle Co. around 1900 and three additional brick 4 and 5 story buildings were added to the 1880 structure. These buildings, together with the boiler and engine house, are used today by a number of small industries.

(Barlow; HHEC; Stone)

ALFRED KIMBALL SHOE COMPANY
45 Blanchard Street
Lawrence

Lawrence
19.322940.472916

This mill was built around 1890 as a plant for the Kimball Shoe Co., a large firm previously located in Haverhill. The building is still in use as a shoe company, although not under the name Kimball. The main mill is patterned after a standard textile mill of the day, being brick, 150' x 75', four stories high with pilaster style walls, and a stair-water cistern tower. The single story boiler house and stack, also dating from 1890, are still in place.

(Stone)

McCABE BOILER COMPANY
9 Water Street
Lawrence

Lawrence
19.323400.472988

The McCabe Boiler Company was established in 1865 by Edward McCabe, a blacksmith who arrived in Lawrence in 1845 to work on the construction of the dam and canal. The company made small boilers for homes and schools, as well as bleaching kiers and water cisterns for the textile mills. Since the 1950s, the company, which is still operated by the McCabe family, has specialized in flanging sheet metal for use in storage tanks. The L-shaped single story wooden frame building which was built in 1865 by Edward McCabe is still in use, although parts of the building have burned and been rebuilt. The pitch roof is supported by a kingrod truss with a span of 35 feet.

(HHEC; interview with McCabe brothers)

BRIGGS AND ALLYN MANUFACTURING COMPANY
Winter and Melvin Streets
Lawrence

Lawrence
19.323140.473004

The Briggs and Allyn Manufacturing Co. was established in 1855 in a small wooden building on this site. The company manufactured wooden accessories such as mantels, stairs, doors, sashes and blinds, as well as wooden tanks and vats. In 1893 a 3 story brick mill, 150' x 40', with a flat roof and pilaster style walls, was completed. The company ceased operations around 1920.

(HHEC; Lawrence Up To Date (Lawrence, 1895); Lawrence Gazetteer, 1894)

Utilities

TOWER HILL HIGH PRESSURE STAND PIPE
near Hillside Avenue and Yale Street
Lawrence

Lawrence
19.321000.473048

The Lawrence high pressure stand pipe was constructed in 1896 to supply water to areas in the neighborhood of the reservoir as well as the business and mill district of Lawrence, which required high-pressure water for fire prevention purposes. The stand pipe itself is steel, 102' high and 30' in diameter, with a capacity of 528,768 gallons. It has an 8" overflow pipe which conducts excess water back to the reservoir. The tank is enclosed by an octagonal tower which is 157 feet in height from the foundation to the top of its octagonal turret roof. The lower 27' of the tower consists of random coursed granite blocks, and the remainder is of brick. Above the level of the stand pipe there is a balcony, which is covered by the chateau style roof sheathed with copper. Beside the octagonal tower is a round stair tower which is slightly shorter than the main structure. This stair tower has a round chateau style turreted roof. Narrow windows with semi-circular arches are placed at intervals throughout the height of both the octagonal and round towers. The stand pipe was designed and constructed by Arthur D. Marble, the city engineer. Marble also constructed the tower. George G. Adams of Lawrence was the architect of the tower. Albert F. Noyes was consulting engineer. (Maurice B. Dorgan, History of Lawrence, Massachusetts (Cambridge, Mass., 1924); The Engineering Record, vol. 39, no.17, 25 March 1899, pp. 376-7.)

LAWRENCE GAS COMPANY
Marston Street near O'Reilley Bridge
Lawrence

Lawrence
19.324540.473038

The Lawrence Gas Company was begun in 1848 by the Essex Company, the Bay State Woolen Mills, and the Atlantic Cotton Mills in order to supply the mill buildings with light. The company was incorporated in 1849 and has maintained operations on the same site to the present. Only one original building remains, a single story brick, pitch roof purifier house, 52' x 34'. Many of the original windows have been enlarged. A brick one story pitch roof exhauster house standing to the southeast of the purifier house was constructed about 1880. All of the other buildings and storage tanks date from the 20th century.

(Insurance Survey, MVTM; Lawrence Atlas, 1896-1926; HHEC; Stone)

PACIFIC MILLS POWER STATION
Essex and Embankment Streets
Lawrence

Lawrence
19.32230.473000

The Pacific Mills Power Station was designed by the Charles T. Main Co. of Boston and built in 1907. It consisted of 3 buildings: a coal storage pocket, 200' x 50', a brick boiler house, 125' x 75', with a flat roof with a monitor, equipped with 24 Bigelow HRT boilers rated at 4300 HP, and a brick turbo-generator house, 125' x 75', equipped with 4 turbo-generators with a capacity of 8 MW. The plant remained in use until the Pacific Mills suspended operations after World War II. Although the 3 buildings are intact, none of the original equipment remains.

(Charles T. Main brochure, 1908, MVTM)

Transportation

BOSTON AND MAINE LOCOMOTIVE SHED AND TURNTABLE
630 South Union Street
Lawrence

Lawrence
19.323740.472772

Only a fragment remains of this locomotive shed of the Boston and Maine Railroad, built about 1910. The turntable and tracks have been covered with asphalt, and 75% of the original semi-circular shed has been removed to make way for a skating rink. The remaining section has an outside length of 175 feet, is a single story brick building 20' high, with rough granite sills and lintels for its numerous double windows. The shed is now used as a repair facility for trucks.

(Lawrence Atlas, 1926)

Bridges

PROSPECT STREET BRIDGE
near Spicket wasteway of North Canal
Lawrence

Lawrence
19.324010.473034

The Prospect Street Bridge was built around 1855 by the Essex Company to connect the mills along the North Canal with the paper companies on the east bank of the Spicket River. It is possible that it was originally intended to lay rails on the bridge, because it is far more massive than necessary for foot and horse-drawn traffic. The bridge is a semi-circular arch with a span of forty feet and a rise of 20 feet. The arch stones are rough cut granite blocks set without mortar. The remainder of the bridge as well as the abutments are uncoursed pieces of granite rubble. The bridge is 30 feet wide. In 1902 the deck of the bridge was widened several feet with a reinforced concrete girder.

(Essex Co. MSS-MVTM)

CENTRAL (CASEY) BRIDGE
foot of Amesbury Street
Lawrence

Lawrence
19.323020.472996

The Central Bridge was designed to handle far more traffic than that of 1918. It was constructed to assure Lawrence a place of importance in the automobile age. The bridge is very wide (80 feet), to allow for pedestrians, motor vehicles, and trolleys. Its construction necessitated the destruction of almost a dozen large mill buildings on the mill islands. It is 1,500 feet in length. It is a reinforced concrete arch bridge, with six 107 foot three-centered spans of the open spandrel type, six 44 foot segmented arch rib spans and one 40 foot concrete arch span. This latter span was considered temporary and was built so as to be easily replaced by a double leaf bascule draw span, in the event that the Merrimack River was made navigable. The two center piers are large enough to handle the bascule configuration. The foundations for the bascule piers were laid with special care, being sunk 55 feet below water and giving a pier height of 99 feet. The abutments are also of unusual size, being wing abutments of 200 feet in



Repairing the abutments of the Prospect Street Bridge, Lawrence, Massachusetts, ca. 1895. Behind the bridge is the Spicket penstock.
(MVTM Collections)

length. The bridge also contains an attractive cement balustrade. The designer and constructing engineer was Benjamin H. Davis of New York City.
(Dorgan, History of Lawrence, Mass., 1924)

LOWER PACIFIC BRIDGE
near Canal and Appleton Streets
Lawrence

Lawrence
19.32310.473024

This bridge was probably built between 1870 and 1885, when the buildings of the lower Pacific Mills were constructed. It is a through, curved chord, pin connected Pratt style truss, with a span of 90 feet, a 10 foot depth at the center panel, and a 20 foot width. The vertical members are stamped "Phoenix Iron Works - Phila" and may possibly have been built by that firm. There are eight panels. All except the end panels have double diagonals. The deck is a modern steel lattice. The bridge has been reinforced with 2 sets of wooden piers and additional stringers and girders.

MANCHESTER AND LAWRENCE RAILROAD BRIDGE
near intersection of Broadway and Merrimack River
Lawrence

Lawrence
19.323620.472972

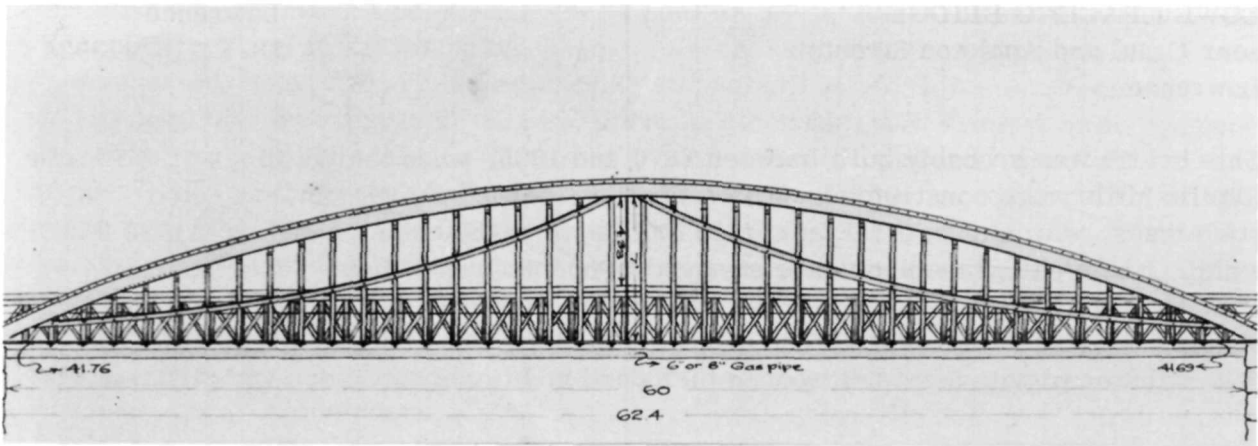
This pin connected, deck, plate girder, Pratt truss railroad bridge was built by the Boston and Maine Railroad in 1871 as part of the Manchester and Lawrence line. Beyond normal repairs and replacement of track and ties, the bridge is unaltered. It consists of 6 spans, each 140' in length, and each with 5 panels. The upper chord and verticals are plate girders, while most of the diagonals and lower chord members are wrought iron bars, pinned together in groups of six. The bridge, which is 20 feet wide, has four Pratt truss systems, interconnected by girders and struts. The truss is shallow, being 8' deep. The piers are cutwater style, constructed of granite blocks with an English bond. The abutments are of the pier variety. The abutment on the north side of the river was extended about 25 feet from the shore in order to avoid skewing the trusses.

(Boston and Maine Railroad office, Billerica, MA)

MUNROE PAPER COMPANY BRIDGE
near intersection of Merrimack Street and South Broadway
Lawrence

Lawrence
19.322760.472958

This Moseley truss bridge is identical in style to the Upper Pacific Moseley truss bridge; they differ only in size, the span of the Munroe Co. bridge being 30' less than that of the Upper Pacific bridge. The deck of the bridge is supported by a modern structure of wooden beams and piers; the truss itself no longer serves a useful function, and is retained only because of its attractive appearance. The bridge was erected in 1867. (Essex Company records - MVTM)



Munroe Company Moseley Truss Bridge, Lawrence, Massachusetts, ca. 1910
(MVTM Collections)

UNION STREET BRIDGE (Duck Bridge)

between Union and South Union Streets over Merrimack River
Lawrence

Lawrence

19.323060.473000

The Union Street bridge was built in 1888 by the Boston Bridge Works. The designer was George L. Vose. It was intended for foot and wheeled traffic between north and south Lawrence, across the Merrimack. It is a through, parallel chord, riveted, double intersection Warren truss bridge, with 5 spans each of 135 feet in length, 4 granite block, cutwater style piers, and 2 granite block pier abutments. The piers were probably constructed for an earlier bridge during the 1850s. The bridge is of lattice and plate girder construction. Each span has 9 panels. The floor was probably originally of wood, but is now a steel lattice deck. The upper lateral system is a double intersection Warren truss. The lower system has iron or steel plate girders and plate girder stringers. The pedestrian hand rails are attractive lattices which duplicate the truss style.

UPPER PACIFIC BRIDGE

Canal Street between Franklin and Hampshire Streets
Lawrence

Lawrence
19.322074.473010

The bridge was built to span the North Canal and connect the Pacific Mills with Canal Street. It was built in 1864 by the Moseley Iron Building Works of Boston. The designer was Thomas W. H. Moseley of Cincinnati, Ohio, who held 2 patents on the upper chord design, dating from 1857 and 1858. The bridge is a bowstring truss, and contains 5 panels. There are no diagonal members. The vertical members are pairs of parallel 3" rods which are riveted to the upper chord and bolted to the lower chord. Each panel has 8 hangers which are bolted to the upper and lower chords. There is a curved member which is riveted to the upper chord and bolted to the intersection of the upper and lower chord. It is probably intended to stiffen the truss. The upper chord is a series of triangular iron sections riveted at 8 foot intervals. The lower chord is a system of parallel iron plates riveted in sections. There is no upper lateral system. The lower lateral system consists of girders similar in style to the upper chord, and wooden stringers. The bridge has been supplemented by a modern wooden system of piers and girders and stringers. Span is 100 feet, depth is 10 feet and width is 18 feet. (Essex Co. records - MVTM; U. S. Patent Office Reports)

WASHINGTON MILLS CANAL BRIDGE

Canal and Mill Streets
Lawrence

Lawrence
19.323032.473025

This bridge was constructed in 1886 when the Washington Mills were erected. It replaced a Moseley bow string truss bridge which had been erected close by during the 1860s. The bridge was used for pedestrians and wheeled traffic over the North Canal. The bridge is a through, single span, inclined chord, pin connected, single system Pratt truss. It has five panels, and is asymmetrical. The deck is cement and asphalt, probably an alteration. Span is 90 feet, rise at center is 8 feet, and width is 15 feet.

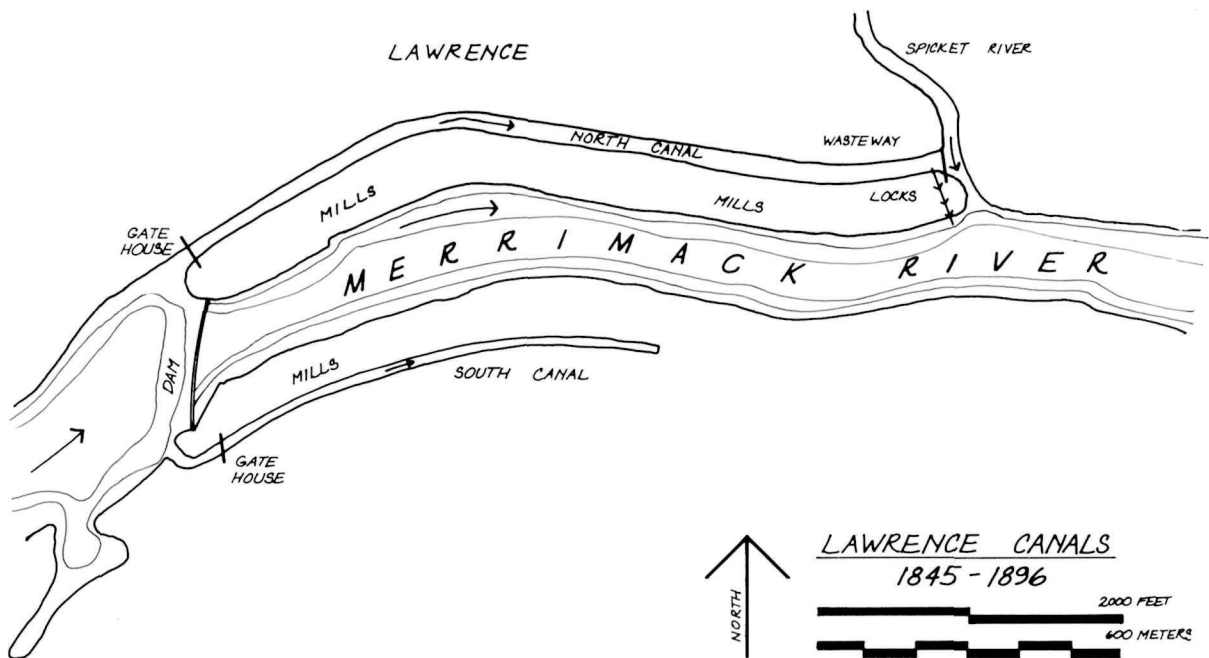
Specialized Structures

GREAT STONE DAM

across Merrimack River at Broadway
Lawrence

Lawrence
19.322540.472966

The Great Stone Dam was designed by Charles Storrow and constructed by Charles Bigelow, both of the Essex Company, the organization which built the water power system and owned all of the land in what is now the city of Lawrence. The dam was built between November of 1845 and November of 1848. The railroad contracting firm of Gilmore and Carpenter performed the actual construction. The dam is sited at Bodwell's Falls, where the Merrimack River drops about 5 feet. The river drops about 30 feet between Hunt's Falls, downstream of Lowell, to Bodwell's Falls, a distance of almost 9 miles. The dam at Lawrence is thus built so as to pond up about 30 feet of water, with flash boards able to store several more feet. Initially a trench



Map of the Lawrence, Massachusetts, Power Canal System, 1845-1896
 (U. S. Census, 1880, vol. XVI)

was blasted out of the river bed of igneous quartzite, and in the trench a row of quarry finished granite blocks, 8' x 3', were laid in hydraulic cement in a row of headers. These blocks were dowelled to each other and the river bed. The face of the dam was constructed on this row of headers, in successive rows of headers and stretchers. All stone in the face of the dam are dressed granite blocks, set in hydraulic cement and dowelled to each other. The blocks were layered in successive rows of headers and stretchers. The height of the dam varies between 30 and 41 feet, depending upon the shape of the river bed. The capping stones are level for 3 feet from the face and then slope upstream 1 foot in 3 feet, for 12 feet beyond which the bank is stepped off at a slope of 45 degrees. The batter of the face of the dam is one foot in 12, and there is no spillway, since the very hard river bed is able to absorb the effect of falling water with no apparent pitting. The dam is 35 feet thick at the base and 13 feet thick at the top. Upstream of the dam face the dam consists of granite rubble set in cement, with a back filling of earth, sloping 6 to 1. The dam is constructed in a curve, the chord of which is 900 feet, with a center ordinate of 14.97 feet. With its very substantial wing walls, also of dressed granite, the total length of the dam is 1,629 feet. With the exception of the present fishway which was built in 1917, the dam has never been altered or repaired since its completion in 1848. The entire cost of the dam, including the construction of coffer dams, was \$250,000. (Essex Co. MSS-MVTM; National Census of 1880)

NORTH CANAL
parallel to Canal Street
Lawrence

Lawrence
19.322520.472992

The North Canal, like the Great Stone Dam, was designed by Charles Storrow, Chief Engineer and Treasurer of the Essex Company. Storrow's successor as Chief Engineer, Charles Bigelow, constructed the canal. Another supervising engineer was Joseph Bennett, translator of J. F. d'Aubisson's Treatise on Hydraulics. The canal was designed to conform with the latest ideas of the French hydraulicians in the design of its sections, its slope, and its almost straight course. The canal is 5,330 feet in length, 100 feet wide at the gatehouse, and 60 feet wide at the Spicket wasteway. Water from the Lawrence millpond flows into the canal and exits into the Spicket River. The average fall is 30 feet. The canal is 12 feet deep at its head and almost 13 feet deep at the wasteway, since the canal bottom is graded to fall 1/2 foot in 5,000 feet. The section of the canal is trapezoidal, with retaining walls of random coursed granite blocks throughout its length. The bottom is sealed with clay puddle to prevent leakage. The canal was completed in 1848, construction having begun in 1845. The gatehouse was completed in 1848, and contains 24 gates, which until 1960 were manually operated on the rack and pinion principal. The present wasteway also dates from 1848. A wooden flume was constructed during the 1880s in order to encourage smoother flow for about 100 yards before the canal flows over the Spicket wasteway. The other major modification occurred in 1961, when the single lock at the head of the canal and the triple lock at its foot were filled in. Several mills continue to make use of the canal's water, which delivers an average of four thousand cubic feet per second of water. (MSS, Essex Co., 6 Essex St., Lawrence; MSS-MVTM; U. S. Census, 1880)

SOUTH CANAL
Parallel to Merrimack Street
Lawrence

Lawrence
19.322640.472948

The South Canal was intended to provide water power for industries in South Lawrence. The canal was constructed in stages, the first 2,000 feet, from the south side of the Great Stone Dam to 500 feet east of Parker Street, being completed in 1866. The canal was extended an additional 750 feet in 1896 to provide water power for a hydro-electric plant. During the years 1906-1910 underground pipes were constructed from the eastern end of the canal to the Ayer and Wood Mills, to provide boiler feed and process water. The canal is rectangular in section, 10 feet deep, and narrows from 60 feet wide at the dam to 15 feet wide at its eastern extremity.

(MSS.-MVTM; U.S. Census, 1880)

SPICKET PENSTOCK
below the Prospect Street Bridge
Lawrence

Lawrence
19.324040.473032

The Spicket Penstock was built around 1855 by the Essex Company to provide water from the North Canal to power the paper mills on the east bank of the Spicket River. The penstock, originally of wood, rested on a stone segmentally arched bridge with a 35 foot span. On the east bank of the Spicket River the penstock extended south for 200 feet, providing water power for the Russell, McAllister and Bacon paper mills, as well as process water. The wooden penstock was replaced by a steel pipe in 1899, and in 1913 a steel and concrete penstock replaced the 1899 pipe. The penstock is still in use.

(Essex Co. MSS-MVTM)

WASHINGTON MILLS GATE HOUSE
Canal Street near Newbury Street
Lawrence

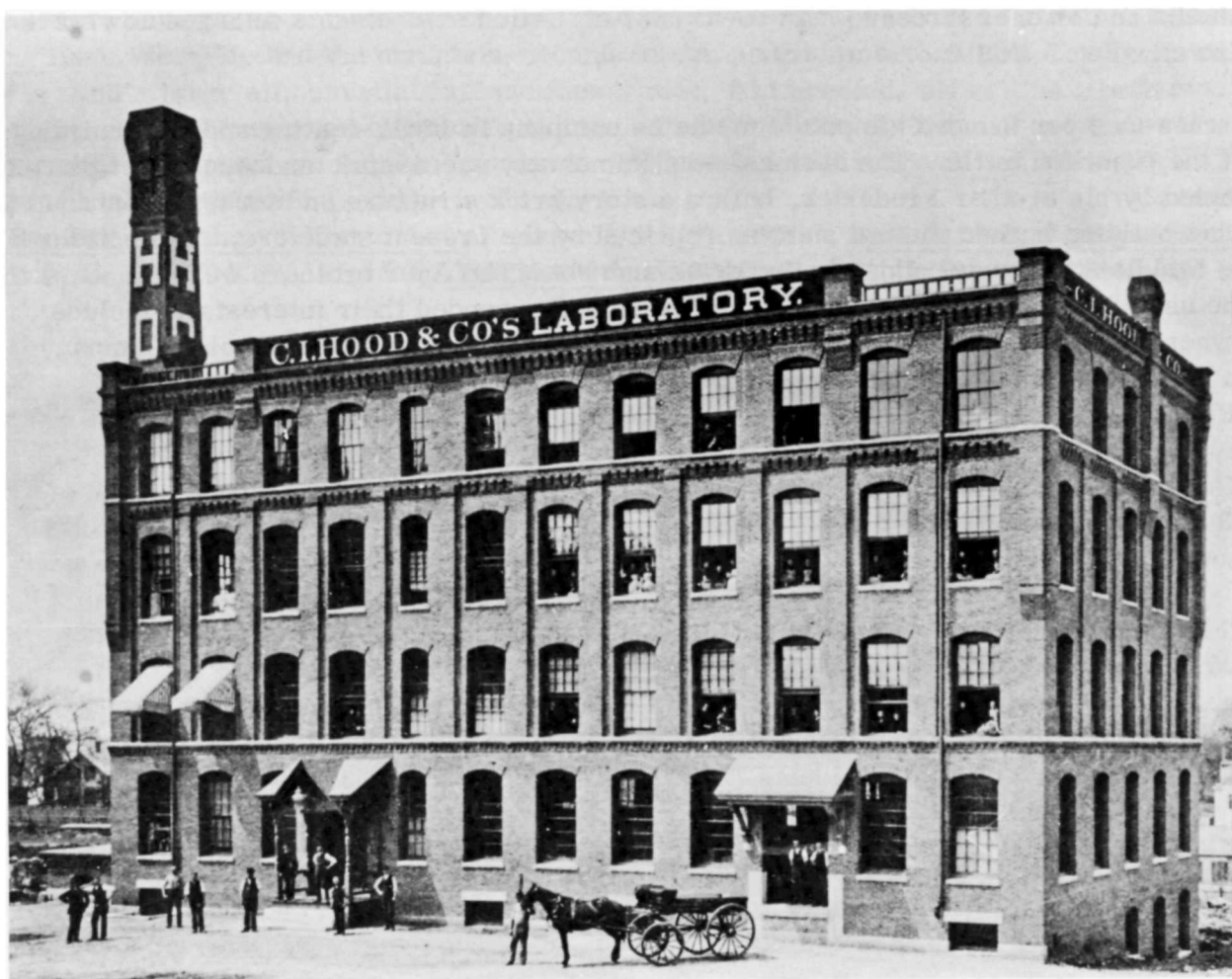
Lawrence
19.323420.473024

This wooden gate house was probably built around 1886, when the Washington Mills were almost completely rebuilt. The purpose of the gate house was to shelter the head-gates of the penstock from the elements, in the same manner as the gatehouses of power canals such as the North Canal Gate House in Lawrence. The gatehouse is entirely functional in design, constructed of wood throughout in a roughly trapezoidal shape. It is built upon the ice boom of the set of penstocks which it regulates. It has one and one-half stories, and is 55' x 14'. The gate machinery is still in place.

(Essex Co. MSS-MVTM; HABS, 1968)

Well Known Industrial Structures No Longer In Existence

Atlantic Mills	Lawrence	19.322880.473014
Main mill, Upper Pacific Mills	Lawrence	19.322680.472992
Russell Paper Company	Lawrence	19.324000.473040



Hood Laboratories, Lowell, Massachusetts, in 1883
(Hill, Lowell Illustrated)

Bulk Products Industries

J. C. AYER PATENT MEDICINE COMPANY
Middle and Palmer Street
Lowell

Lowell
19.310400.472374

James C. Ayer founded his patent medicine company in 1841, renting space in buildings of the Hamilton mills. The business was immensely successful, and Ayer, by this time joined by his brother Frederick, built a 4 story brick structure on Market Street in 1857. This building burned in 1864 and was replaced by the present structure. The buildings on Middle Street were added in the 1870s and 80s. The Ayer brothers were pioneers in the use of advertising to sell their medicines and expanded their interests to include ownership of the Suffolk-Termont mills in Lowell and the American Woolen Company in Lawrence.

(HHMC)

CARLETON AND HOVEY COMPANY ("Father John's Medicine")
93 Market Street
Lowell

Lowell
19.310610.472371

The Carleton and Hovey Company was established as a drug store in Lowell in 1830 and began marketing "Father John's Medicine," a cough and cold remedy, in 1860. During the early 20th century the firm expanded its operations, building the attractive 5 story brick structure on this site around 1910.

(Contributions of the Old Residents (Lowell, 1880), vol. II, no. 3; Stone)

HOOD LABORATORIES
Thorndike and Hale Streets
Lowell

Lowell
19.310160.472296

Charles Hood, a Lowell druggist, began to market his sarsaparilla, tooth powder, vegetable pills and olive ointment in 1870. Hood was a brilliant advertiser, and his business prospered. In 1883 he built the present 4 story brick structure with walls which decreased their thickness from the exterior rather than the interior sides, allowing the architect to construct two additional rows of corbelling. A boiler house was also built in 1883. Additional buildings were added to the 1883 structures in the years 1885-1895. Hood suspended operations around 1910 as a result of muckraking articles concerning his medicine. The buildings were occupied by the C. F. Hatch Paper Box Company. They are now used as warehouses.

(Frank P. Hill, Lowell Illustrated (Lowell, 1884); Stone)

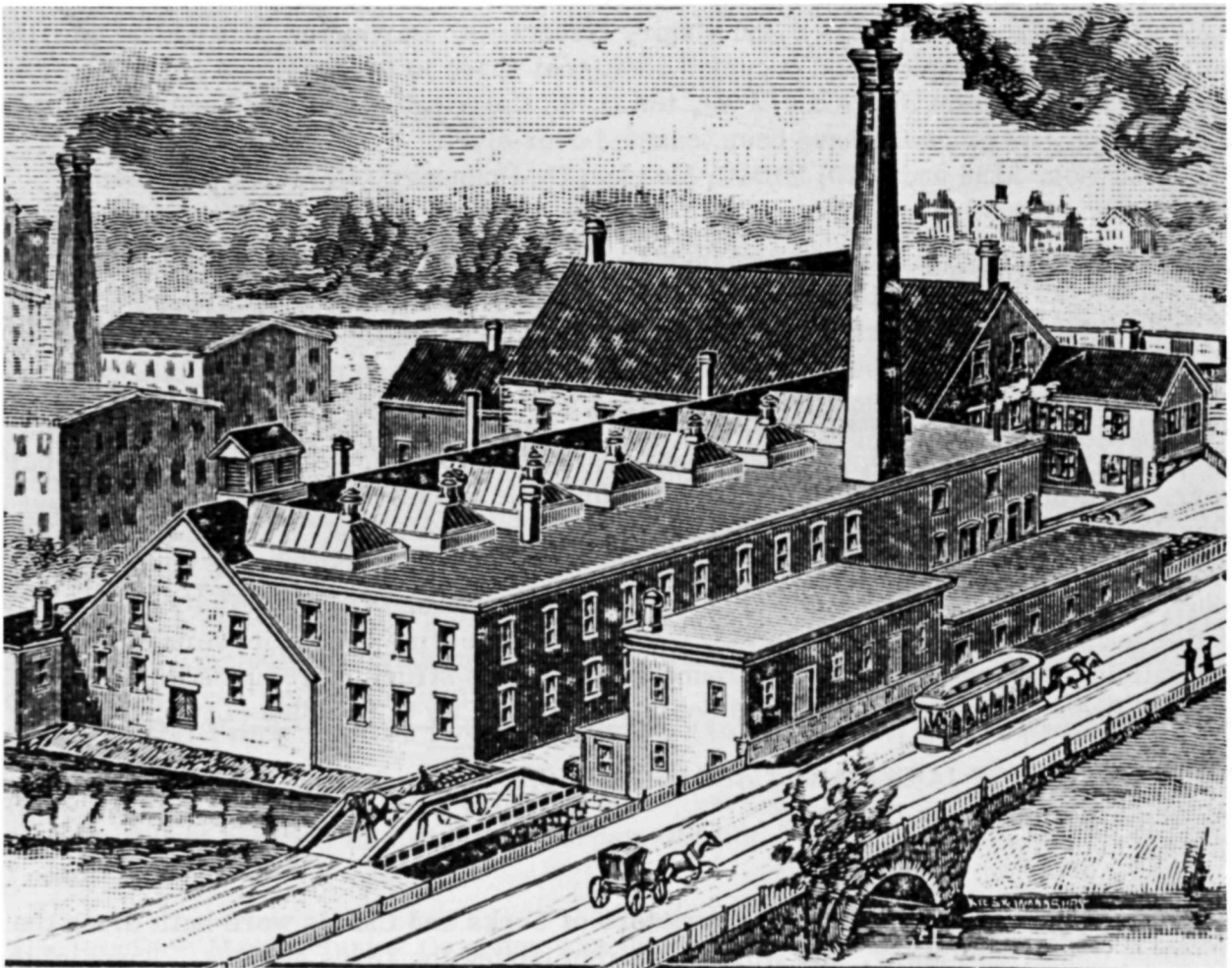
WHIPPLE POWDER MILL (American Bolt Co.)
next to 576 Lawrence Street
Lowell

Lowell
19.311200.472242

Between 1821 and 1825 Moses Hale and Oliver M. Whipple built this powder mill parallel to the newly constructed Wamesit Canal. It is a 2 story pitch roof structure built of uncoursed granite rubble, with quoins, lintels and sills of quarry faced granite

blocks. A large dormer was added at an unknown date, fracturing the lintel below it. Traces of the original wheelpit can be seen in the first floor. A penstock, flume and tailrace, on the east side of the building are still in place. They were probably added in the 1880s. In 1847 Whipple rented part of the mill to J. Meadowcroft and George Smith, who began to manufacture bolts. In 1855 these men purchased the entire building from Whipple, and the structure became known as the American Bolt Company. At this time a large ell, parallel to Lawrence Street, was erected, as well as a boiler house, engine house, and other outbuildings. Today only the 1820s mill and the 1855 ell remain, abandoned and in poor condition. The powder mill is the oldest surviving industrial structure in Lowell.

(Handbook for the Visitor to Lowell (Lowell, 1848); HHMC; Lowell, A City of Spindles (Lowell, 1900); J. W. Meader, The Merrimack River (Boston, 1871), pp. 264-8.)



The American Bolt Company, Lowell, Massachusetts, ca. 1880. The building at the right is the Whipple Powder Mill. The other buildings were constructed during the years 1855-1880.

(Lowell Souvenir)

UNITED STATES CARTRIDGE COMPANY
687 Lawrence Street
Lowell

Lowell
19.311170.472228

The U. S. Cartridge Co. was established in 1869 by General Benjamin Butler. The firm manufactured small arms ammunition in considerable quantities. In 1890 it produced 12,000,000 metallic cartridges, 2,000,000 shotgun shells, and 2,000,000 primers per month. An insurance survey of 1874 shows that the company occupied a 3 story wooden frame building 150' x 30', with a 40' x 50' ell. All power was by means of steam. This building, covered with asbestos sheathing, still remains. By 1894 U. S. Cartridge occupied 8 new buildings adjacent to the original factory. These buildings, too, were all of wood construction. Captain J. V. Meigs of the Bureau of Ordnance experimented on chamber pressures for breech loading rifles during the 1870s, in a portion of the U. S. Cartridge Co. The company was one of the first manufacturers of fixed rifle ammunition, i.e. ammunition in which the primer, propellant, and projectile are manufactured as a single unit. During the 20th century all of the buildings except the 1865 mill were replaced with brick 3 and 4 story structures. During the first World War the company expanded rapidly and occupied additional space in the buildings of the Bigelow Carpet Co. on Market St. After WWI, the U. S. Cartridge Co. ceased operations. Its buildings on Lawrence St. have been tenanted ever since.

(Barlow, Nos. 3196 and 9070; HHMC; Meader; D. Prigmore, President, Wamesit Power Co., Lowell)

HARVARD BREWERY
24 Payton Street
Lowell

Lowell
19.310111.472125

The Harvard Brewery, established about 1875, was Lowell's largest producer of ale, beer, and porter. A 1900 advertisement boasts of a production of 300,000 barrels per year, and illustrates an office, bottling building, ale house, brewery, boiler house, storehouse and stables. None of these buildings are intact today. The brewery (1875) was demolished in 1965 for a shopping center. The ale house (1875) was burned in 1964. Originally 5 stories high, only two stories now remain. The office building, boiler house and stables (1890) were razed at the same time as the brewery. The bottling building was greatly expanded around 1910 and this structure remains in use.

(Calvin Beede, owner, O. Beede and Sons; Lowell, A City of Spindles (Lowell, 1900).

PROPRIETORS OF LOCKS AND CANALS WORKSHOPS
on Western Canal near Broadway
Lowell

Lowell
19.310040.472366

The offices and workshops of the Proprietors of Locks and Canals were built along the Western Canal, Broadway, and Worthen Street during the 1820s and 30s. Three of the shops remain. Two are of wood and one is constructed of brick. All are pitch roofed and they are adjoining. Their total length is 100 feet, and their width is 25 feet. The buildings are said to contain a large number of patterns as well as a number of tools and machines, most notably a rotary planer. The owner will not allow anyone to enter the buildings. The Proprietors of Locks and Canals moved their offices to the Boott Mills during the 1950s, and the office buildings and shops have been used for storage ever since.

(John Macheras, owner, Lowell)

APPLETON COMPANY

Jackson Street between Revere and Hamilton Streets
Lowell

Lowell

19.310320.472343

The Appleton Company was established in 1828 as a manufactory of sheetings, shirtings, and drills. It drew the water for its water wheels and later its turbines from the Hamilton Canal, and its tailraces faced on the Lower Pawtucket Canal. In 1839 the company's annual production was 5,000,000 yards of cloth. In 1890 it was close to 20,000,000 yards. The company suspended operations in the 1930s, and has been tenanted ever since. Ten turbines are still in place. The two oldest are McCormack horizontal turbines (1901). The two latest turbines are horizontally mounted Hunt wheels. None of the original buildings remain. The two oldest surviving structures are a cotton storehouse dating from about 1890 and a spinning and weaving mill, entirely steam powered, which was built in 1873.

(Barlow, No. 7519; FM, No. 9346; F. P. Hill, Lowell Illustrated (Lowell, 1884); HHMC)

BOOTT MILLS

Amory Street
Lowell

Lowell

19.310800.472410

The Boott Mills were established in 1835 by Abbott and Nathan Lawrence and John A. Lowell. It was named after Kirk Boott, Treasurer of the Merrimack Mills, the first mills in Lowell. By 1848 the Boott produced 10.5 million yards of heavy drills, fine shirtings and print cloth per year. The mills contained 35,000 spindles. In 1884 the Boott contained 140,000 spindles and 3,875 looms. All of the 6 original mills, built between 1835 and 1843, are standing, although the original pitch and clerestory monitor roofs have been replaced by an additional story and flat roofs. In the 1860s several large additional buildings were added. These buildings are also still in place. The engine and boiler house were built in 1885. The steam engines produced 2400 HP. The main source of power was that of breast wheels, then water turbines, which were supplied with water from the Eastern Canal. Seven turbines remain in the wheel pits of the Boott, including 2 Swain turbines dating from 1874 and 1875, two Allis-Chalmers (1940s) and three Leffels (1920s).

(Barlow; FM; Frank P. Hill, Lowell Illustrated (Lowell, 1884); Mel Lesberg, Manager)

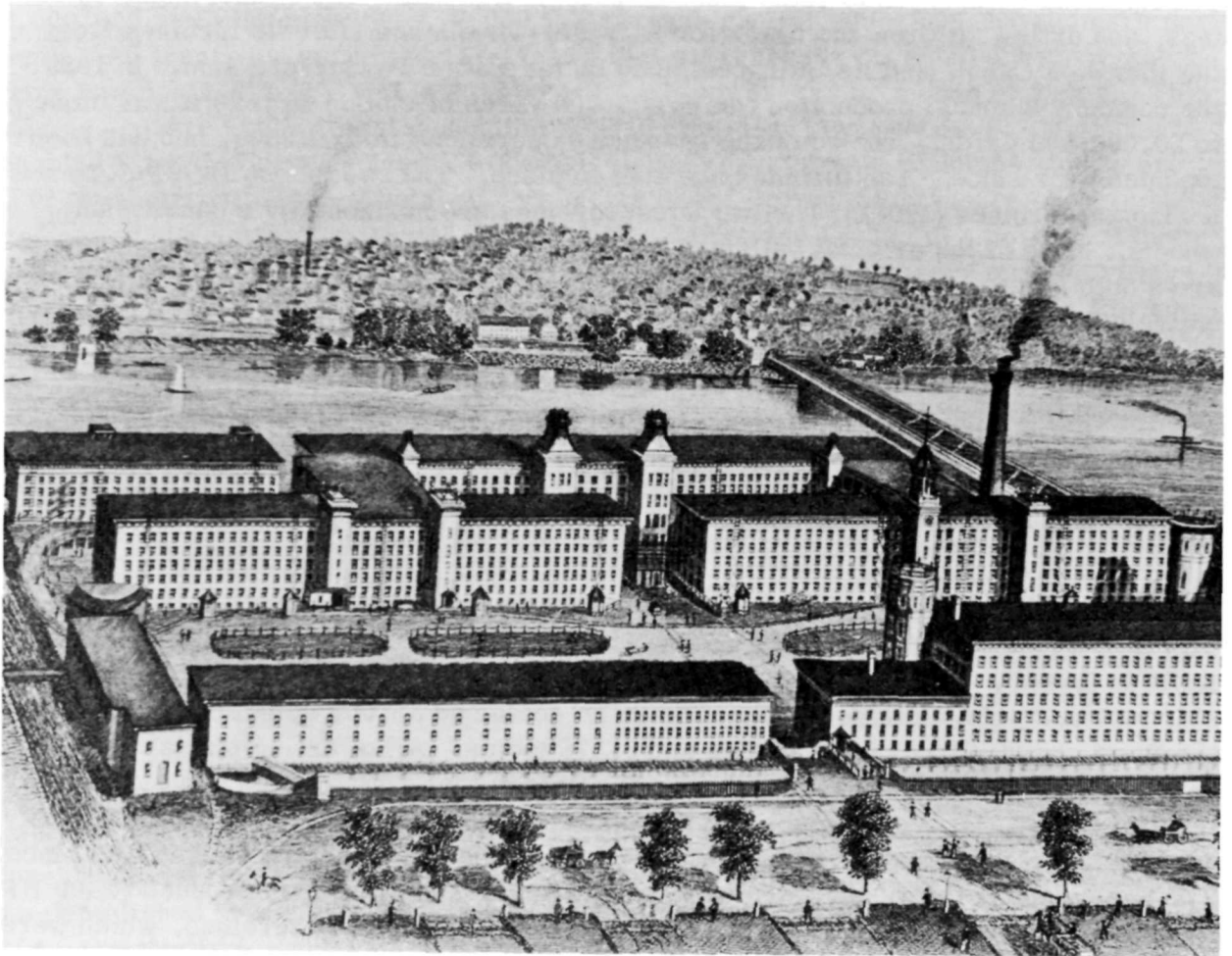
HAMILTON MANUFACTURING COMPANY

Jackson Street between Hamilton and Gorham Streets
Lowell

Lowell

19.310560.472352

The Hamilton Manufacturing Company was the second of the large cotton corporations to begin operations in Lowell, its first mill going into production in 1826. The company was sited on the Hamilton Canal, and the water from this canal passed through its wheelpits, dropping 13 feet into the Lower Pawtucket Canal. The Hamilton manufactured shirtings, sheetings, drills, and print cloth. Like those of the Merrimack Manufacturing Company, the Hamilton's owners constructed a print works in 1828. The company, in 1839, produced 5 million yards of cloth annually. By 1890 the figure had risen to almost 40 million yards. The Hamilton continued operations until after World War II, when it ceased operations. The mill has been tenanted ever since. The print works have been



Boott Mills, Lowell, Massachusetts, ca. 1880
(Lowell Souvenir)

totally removed, and only one of the original mills remains. This structure is Mill No. 4, built in 1847. The mill was originally 4 stories high, 50 feet wide, and 400 feet in length, twice the size of the original "Waltham style" mills. It had a pitch roof with dormers at 10 foot intervals, one stair tower and a water closet tower. An unusual feature in the building's construction is the use of only a single row of wooden columns, allowing a bay 25 feet deep and 10 feet wide. Most mills employed a double row of columns. In 1882 a 6 story mill was completed that was adjacent to Mill No. 4 and about 90 feet of the old mill was demolished to accommodate the new structure. Sometime during the 1880s the pitch roof was removed from Mill No. 4 and 2 additional stories were added, with a flat roof. All of the remaining buildings in the Hamilton yard date from the very late 19th and early 20th centuries. (Frank P. Hill, *Lowell Illustrated* (Lowell, 1884); HHMC)

INTERNATIONAL COTTON COMPANY
117 Marginal Street
Lowell

Lowell
19.308260.472326

This is the only mill complex in Lowell to be entirely constructed of reinforced concrete. The mill and storehouse were built as an addition to the weaving mill which had been erected in 1896 as the Lowell Weaving Co., and which was absorbed by the International Cotton Co. in 1913. Around 1920 the International Cotton Co. built this mill to house carding, spinning, twisting, and weaving equipment to expand the production of tire fabric, duck, and sailcloth. In 1925 the New England Southern Mills Co. bought the complex and converted the operations, with the addition of the 1896 mill, to the production of wide cotton sheets. 174 cards and 800 broadlooms were installed in the main mill. In 1929, the New England Southern Mills collapsed, and its Lowell complex was vacant until 1940, when it was used as a rubber factory. In 1947 the General Electric Co. bought the complex and continues to occupy the buildings. (*Davison's Textile Blue Book*, 1920-29; Thomas McQuade, Plant Engineer, GE; Margaret T. Parker, *Lowell, a Study of Industrial Development* (New York, 1940).)

LAWRENCE MANUFACTURING COMPANY
Perkins Street
Lowell

Lowell
19.310160.472460

The Lawrence Manufacturing Company, named after the Boston family of financiers who invested so heavily in the industries of Lowell, was incorporated in 1831 by William Appleton and Benjamin R. Nichols, and by 1848 included 45,000 spindles, manufacturing 13.5 million yards of print cloths, shirtings and sheetings per year. In 1864 the Company added knitting frames and began to produce hosiery and knit underwear. By 1885 the mills included 105,000 spindles and 2,360 looms and knitting frames. In one week the company manufactured 425,000 yards of cloth and about 300,000 items of knitwear. Power was supplied by means of water from the Lawrence Canal and steam engines which were installed in the 1870s and 80s. Water turbines produced about 3500 HP and steam engines produced an additional 2700 HP. Six turbines remain in use, all of which are Hercules turbines dating from 1909-1916.

Two of the original 1832 mills remain, although altered by the addition of a fifth story. The mill which connects these two buildings was constructed in 1855. Two other mill buildings facing upon the river were built in 1861 and 1870, but were constructed in an almost identical fashion to the 1832 mills. A bleaching house, built in 1876, remains unaltered, as does an 1876 boiler house, engine house and octagonal chimney. An 1835 cotton storehouse remains largely unaltered. The remaining buildings were erected in the years 1890-1910.

(FM; Handbook for the Visitor to Lowell (Lowell, 1848); Hill)

LOWELL WEAVING MILL
117 Marginal Street
Lowell

Lowell
19.308260.472318

The Lowell Weaving Mill was constructed in 1896 as a weaving mill for the William Whitman Company which had mills in New Bedford and Lawrence, Mass. The mill was used to weave cotton duck and cotton cloth for use in bicycle tires. In 1913 the company became part of the International Cotton Mills, which owned mills in New England and the South. Its product remained the same, and did not change when new owners, the New England Southern Mills, took over around 1925. This firm collapsed in 1929 and the mill remained vacant until 1940, when it was used as a tire mill. In 1947 it was purchased by General Electric and has remained a part of the General Electric Co. The mill is transitional in form. The walls are reinforced concrete, but the pillars and floors are of wood. The mill is 2 stories high, with a flat roof and two castellated stair towers.

(Blue Book; Thomas McQuade, Plant Engineer, GE; Parker)

MASSACHUSETTS MILLS
Bridge Street and Central Bridge
Lowell

Lowell
19.311000.472400

The Massachusetts Mills were the last of the large textile mills to be incorporated in Lowell, being established in 1839 by John A. Lowell and Abbott Lawrence. In 1848 the company operated 46,000 spindles and manufactured 25 million yards of sheetings, shirtings, and drillings per year. This continued to be the company's product until the 1940s, when all operations were transferred to the company's mills in the south. The buildings today are occupied by a considerable number of tenant industries. The Massachusetts, sited at a point of land between the Concord and Merrimack Rivers, drew its water power from the Eastern Canal, and employed steam engines as well. The wheel house, rebuilt in 1872-1888, contains 6 Hercules turbines dating from 1910-1921, still in operation. The boiler and power houses, built in 1910, are used for other purposes. The 4 original mill buildings, constructed in 1839, are in place, although altered by the addition of a fifth story and a shallow pitch roof. They are standard sized first generation Lowell mills, 200' x 50', with 4 stories and a basement. The 4 original buildings have been connected by additional structures erected in the 1860s and 1870s. most interesting of the modern buildings is an 11 story, reinforced concrete storehouse dating from 1910. It was designed by Lockwood Greene Engineers. It is constructed of reinforced concrete and brick and has load bearing

walls at 64 foot intervals in its 256 foot length. The basement, 3rd, 6th and 9th floors are concrete, the rest are of wood. The pillars are cast iron. It is a good example of a textile building constructed during the transition from brick to concrete.

(Barlow; FM; Handbook for the Visitor to Lowell (Lowell, 1848); Hill)

SUFFOLK MANUFACTURING COMPANY
Suffolk Street and Northern Canal
Lowell

Lowell
19.310140.472432

The Suffolk Manufacturing Company was organized in 1831 for the manufacture of cotton sheetings, shirtings and drills. It drew water from the Western Canal and discharged it into the Lower Western or Lawrence Canal, after a drop of 13 feet. The Suffolk was poorly managed during the Civil War years and the mill passed into the control of the Ayer brothers in 1871, together with the Tremont Mills, which faced the Suffolk Mills across the Western Canal. From this point onward the Company was known as the Suffolk and Tremont Mills. During the 1930s the mills were closed and became tenanted properties. The Suffolk remains so today, but the Tremont has been completely destroyed as part of urban renewal. Of the 1831 buildings, only the counting house remains. The remaining original buildings were replaced with larger structures during the 1860s.

(Hill; HHMC)

BELVIDERE WOOLEN MILL NO. 2
Lawrence Street
Lowell

Lowell
19.311160.472244

The Belvidere Woolen Mill No. 2 was built in 1862 as a branch of the Belvidere Woolen Co. which had been organized in 1821, and which had operated several mills on the east bank of the Concord River since that date. The owners of the Belvidere had contracted to set up a woolen mill for C. P. Talbot and Company of North Billerica, and the agreement was profitably concluded in 1862. The profits from this venture were used to build the new mill. Since there were no sites available near the original mills, the new mill was built on the Wamesit Canal mill island, next to the Whipple Mill. The mill, like those of the parent company, manufactured flannels. In 1929 this mill was bought by the Stirling Woolen Mills of Lowell. In recent years it has been used as a warehouse. The four original buildings are still intact. The main mill, 100' x 75', originally had a combined clerestory and trapdoor monitor roof, but the mill now has a slightly pitched roof and an additional story, to make it 4 stories high with a basement. The storehouse, 42' x 40', is intact, as is the dye house and power house. The mill employed 2 boilers, a single 100 HP engine, and a water turbine of 75 HP. Fire and process water was obtained from the Wamesit Canal.

(Bagnall MSS; Barlow; FM; Meader)

DUGDALE WORSTED MILL
Southwest corner of Willie Street and Broadway
Lowell

Lowell
19.309620.472464

James Dugdale, who arrived in the United States in 1847, began spinning and braiding worsted yarn in this mill in 1868. The main building was of stone, 3 stories high, with an attic. The roof was pitched, with skylights. Power was entirely by steam, with two boilers and one engine of unknown power. The round chimney was also constructed of granite, a rare occurrence. In 1893 a fire burned the roofs of the mill, dye house, and boiler house. It was probably at this time that the main building was lowered to 2 stories, with a flat roof. The chimney, originally about 75' high, has been lowered to a height of about 20'.

(Barlow; HHMC)

MASSACHUSETTS MOHAIR PLUSH COMPANY
122 Western Avenue
Lowell

Lowell
19.310740.472320

The Massachusetts Mohair Plush Company was organized in 1891 for the manufacture of worsted yarns and mohair plush upholstery, primarily for use in passenger trains. The company was one of the first in the United States to manufacture what had previously been an English import. The company used steam power, drawing water from the Upper Pawtucket Canal for its boilers and for process water. It was one of the few mills to remain in business during the depression of the 1930s, and was only dissolved during the 1950s. The original 4 story brick mill, dating from 1890, is still in place. The remaining mills, of standard mill construction, were built during the years 1906-1920.

(Frederick W. Coburn, History of Lowell (New York, 1926); Lowell City Atlas, 1896, 1906, 1924; Parker; Stone)

STIRLING WOOLEN MILLS
576 Lawrence Street
Lowell

Lowell
19.311290.472246

The Stirling Woolen Mill is a fine example of a New England woolen manufacturing company of the 19th and early 20th centuries: it is small, located on a site with limited water power, and is entirely self contained. The mill was built on the site of the Hale-Whipple Gunpowder Mills, on the island formed between the Wamesit Canal and Concord River-Meadow Brook. The main mill was built in 1880 and enlarged in 1896. The power house, which originally housed 3 boilers, a 200 HP steam engine, a 96 HP water turbine, and a dye house, was built in 1883. The smokestack was rebuilt in 1890. The 1897 storehouse is of particular interest. The floor beams are bolted to the walls, a technique of mill construction that was obsolete by 1880. In 1907 a single storied flat roof building was constructed over Meadow Brook, connecting the store house and main mill. It was used to house carbonising machinery, a process of scouring wool and of removing cellulose fibers by means of an acid bath. Few mills employed carbonising machinery at so early a date. Waste water and acid was dumped through the floor into

the Brook. The main mill is 4 stories high with a water cistern tower. It is 240' x 60'. The ell was added in 1896. All of the mill buildings are in use except for the power house, which is used for storage. At its peak of operation, around 1920, the mill employed 100 workers. It manufactured flannel, broadcloths, and women's suitings. In 1929 the mill contained 14 sets of cards, 7,000 mule spindles and 94 broadlooms.

(FM; Stone)

UNITED STATES BUNTING COMPANY
Watson Street
Lowell

Lowell
19.311140.472246

The U. S. Bunting Co. was organized and began operations in 1865. Its chief organizer was General Benjamin Butler. The company was the first in the United States to manufacture bunting, and enjoyed a contract with the Federal Government as the exclusive supplier of bunting (flags) to the American Armed Forces until well after WWI. During the 1930s the company went into bankruptcy. Of the original mills there are no survivors. Two buildings dating from the 1880s, with 3 stories and a basement, and each about 150' x 60', still remain. Power was by means of both steam and water. Two horizontal turbines, of the Leffel variety, with their penstock, are in place and easily accessible to examination. They probably date from the years 1900-1920. The Lombard flyball governor (1894-1910) for the turbines is also still in place. (Barlow, #3196; HHMC; Meader; D. Prigmore, President, Wamesit Power Co., Lowell)

WILLIAM WALKER AND SONS WOOLEN MILL
260 Lawrence Street
Lowell

Lowell
19.311090.472400

In 1864 William Walker erected a brick mill at the Massic Falls of the Concord and began manufacturing indigo dyed flannels. Business prospered, and around 1870 he erected the wooden mill and stone storehouse which remain on the site today. In 1888 the business was sold to W. M. Crossley, who continued operations until around 1900, when the company was absorbed by the Wamesit Power Co., probably as a branch of U. S. Bunting Co. In 1890 its capacity was 6 sets of cards and 1,600 spindles, a woolen mill of average size for the day. Since the 1940s the storehouse and wooden mill building have been occupied by the present owners. The storehouse is a single story in height, with a shallow pitch roof, and is constructed of random coursed granite rubble on the Lawrence St. side and uncoursed granite rubble on the remaining sides. It is 75' x 25'. The wooden mill is 2 stories high with a shallow pitch roof with a monitor. It is 75' x 25'.

(HHMC; Lowell Atlas, 1879, 1906)

LOWELL HOSIERY COMPANY
261 Mount Vernon Street
Lowell

Lowell
19.309440.472357

The 3 mills of the Lowell Hosiery Company were built within 5 years of the company's incorporation in 1869. The earliest of the buildings is a structure of uncoursed granite

rubble, with quarry faced granite blocks used as quoins as well as to edge the windows of the mill. The building was originally 3 stories high, with an attic and pitch roof, but at some time the third story and attic have been removed and replaced with a shallow pitch roof. The other 2 mill buildings were built prior to 1876 and are identical in style. A single story boiler house is attached to the smaller of the 2 buildings, but the chimney has been removed. The company was organized in 1869 for the manufacture of women's and children's a plain and fancy cotton hosiery. In 1890 its annual production was almost 3 million pairs of hose. The company employed 300 workers. The company ceased operations immediately after World War I and has been used for warehousing from that time to the present.

(HHMC; Lowell Atlas, 1879, 1896, 1906, 1924; Lowell birdseye view, 1976)

PICKERING KNITTING COMPANY AND

Lowell

COBURN SHUTTLE COMPANY

19.309870.472184

Tanner and Lincoln Streets

Lowell

In 1882 C. C. Pickering began to manufacture children's and women's knit underwear in a steam powered mill constructed in South Lowell near River Meadow Brook. By 1888 about one quarter of the mill was tenanted by the Coburn Shuttle Co., and in 1891 The Pickering Co. moved to a new mill and the entire structure on Tanner and Lincoln Streets was taken over by Coburn Shuttle. By 1894 the mill had become part of the U.S. Bobbin and Shuttle Co. In 1903 the buildings were converted to the manufacture of insulated wire, and remained so until the 1950s when it was tenanted by a number of companies. The original mill and boiler house remain intact, although additional structures have been added.

(Barlow, #9578; HHMC; Parker; Stone)

PICKERING KNITTING COMPANY

Lowell

1499 Middlesex Street

19.307680.472308

Lowell

The Pickering Knitting Company was organized in 1882 in a mill at Tanner and Lincoln Streets for the manufacture of cotton underwear. In 1891 the company built this mill on Middlesex Street for unknown reasons, since it is almost identical in size to the Tanner Street complex. This mill includes a main building, storehouse and boiler house. In 1908 John C. Meyer, a Boston thread manufacturer, took over the complex and changed the stone sign on the stair tower from PKC to John C. Meyer. Meyer went out of business in the 1930s and the mill was tenanted until purchased by Avco around 1965.

(HHMC; Lowell of Today (Lowell, 1893); Stone)

SHAW STOCKING COMPANY

Lowell

244 Smith Street

19.309460.472222

Lowell

The Shaw Stocking Co. originated in 1877 when Benjamin F. Shaw began to knit seamless stockings on a knitting frame which he invented. The invention proved successful and in

1879, with a capitalization of \$160,000, Mill No. 1 of the Shaw Stocking Co. was built on the site of the present complex at the intersection of Smith and Shaw Streets. The Company prospered greatly and in 1893 an additional 2 story mill, 251' x 75', to be used for finishing processes on the stockings, was finished. Mill No. 1 was used strictly for knitting. Mill No. 3, two stories high, brick, and 235' x 74', was finished in 1900 and was used to make the company's shipping boxes and trade circulars. The last mill, No. 4, was finished in 1907. All of these buildings are largely intact. In 1900 the company employed about 600 workers and produced 8,400 pairs of stockings daily on 273 knitting frames. By 1928 there were 750 looms and 12,500 spindles in place. The company ceased operations during the depression of the 1930s and has been used by tenant industries ever since.

(Hill; HHMC; Lowell Today (Lowell, 1893); Stone)

LOWELL MANUFACTURING COMPANY

Market, Gorham and Dutton Streets
Lowell

Lowell

19.310160.472350

The Lowell Manufacturing Company began operations in 1828 as a maker of Osnaburgs or Negro Cloth. Hand woven carpets were also made. In 1842 the Bigelow power carpet loom was introduced, and in 1848 the company switched its entire operation to carpet making. In 1914 the Company moved its operations to Thompsonville, Conn., as part of a conglomerate of carpet manufacturers which had been organized in 1901. The buildings were leased to the U. S. Cartridge Co. until 1920 when they were distributed among a number of small manufacturers. None of the original buildings survive and the Lowell Canal, which supplied power for the Company, has been covered over. The oldest remaining building is an 1880 weaving mill for Brussels Carpets, 3 stories high, 400' x 75'. The mill ran by steam power, and the boiler house built to house the boiler for the 500 HP steam engine is still standing, but is now derelict. (FM, No. 3079, 9340; J. S. Erving & N. P. Norton, Broadlooms and Businessmen (Cambridge, Mass., 1955); Hill)

WHITTIER COTTON MILLS

Stackpole and Brown Streets
Lowell

Lowell

19.311080.472382

The Whittier Cotton Mills were begun in 1867 by Moses Whittier, who arrived in Lowell in 1829 and who became an overseer in the Merrimack and Boott Mills. In 1878 the present mill was constructed. It was originally 2 stories in height, 105' x 50', with an attached single story picker house and boiler house. The steam engine, which provided all of the mill's power, was located in the main mill itself. In 1881 a third story was added, and it was probably at this time that the attractive stair tower was completed. A water closet tower, located to empty into the Concord River, has been removed. The mill, with 3,500 spindles, produced cotton twine, bandings, and rope. Around 1900, following the death of Moses Whittier and his son Henry, the business was liquidated and the building was sold to the Wamesit Power Co. During the 1950s the mill was bought by Immaculate Conception Roman Catholic Church, which uses the structure as a parish hall.

(Barlow, No. 7339; HHMC; Lowell Atlas, 1879, 1896, 1906)

LOWELL BLEACHERY
Bleachery and Moore Streets
Lowell

Lowell
19.311000.472220

The Lowell Bleachery was established in 1833 near the Wamesit Canal, operating as a bleaching and dyeing works for the Lowell mills. In 1890 the bleachery employed 400 workers and had a total bleaching/dyeing output of 25 million yards per year. The bleachery went out of business during the 1930s. The only remaining structure is a brick 3 story structure dating from the 1920s. All other buildings, as well as the penstock from the Wamesit Canal, have been removed and replaced with sheet metal warehouses.
(HHMC; Stone)

BELVIDERE WOOLEN MILLS STOREHOUSE
foot of Chestnut Street
Lowell

Lowell
19.311160.472353

Woolen mills have stood on this site at the lower falls of the Concord River since 1826. Only one building survives, a 2 story brick structure with a pitch roof, 75' x 50', with no basement built around 1830. The second floor is supported by the vertical members of the queenrod truss roof. The building never contained any type of power transmission equipment, and the windows are few and quite small, hence its designation as a storehouse. One end of the roof has collapsed and many of the windows have been removed. This is probably the second oldest mill building in Lowell, after the Whipple powder mill.
(Bagnall MSS; HHMC)

Manufacturing Industries

ATHERTON MACHINE COMPANY
50 Pheonix Avenue
Lowell

Lowell
19.312800,472150

In 1866 A. T. and C. T. Atherton began the manufacture of cotton picking machinery in Lowell. In 1888 there was a reorganization and expansion. The Atherton Machine Co. built a shop in Pawtucket, Rhode Island, and also at the site of the present building on Phoenix Ave., on the Lowell-Tewksbury line. The company prospered as a manufacturer of cotton picking, carding, drawing and ring spinning machines. Despite its prosperity, the company was in a confused financial state by 1896 and in 1905 the Lowell Machine Shop absorbed the firm for about 1/3 of its real value. When the Saco-Lowell shops dismantled its operations in Lowell, the Atherton shops were abandoned. They were tenanted until several years ago, when all but a portion of the machine shop was demolished. The site is now practically deserted, and is in a deteriorated state. In 1890 the facilities included an office building, a large, well equipped foundry, a pattern house, boiler house and engine house, in addition to the machine shop, which was 3 stories high, 300' x 45' with an ell of 100' x 45'. Today only a 150' x 45' section of the shop survives, including the stair-water cistern tower.
(George S. Gibb, The Saco-Lowell Shops (Cambridge, Mass., 1950); Lowell Today; Souvenir)

BROWN REED COMPANY
148 Warren Street
Lowell

Lowell
19.311110.472340

The Darius C. Brown Reed Company was organized around 1847 for the manufacture of such loom accessories as reeds, heddles, and shuttles. During the 1880s, the buildings were tenanted by other small businesses in addition to the reed-making concern, and has been tenanted by various concerns ever since. The building is roughly shaped in the form of an L, with the short end parallel to the Concord River. The building is 3 stories, with a shallow pitch roof which is probably original. It is unusual for a shallow pitch mill to have been built at such an early date. The mill is made of granite rubble, except in the section facing on Church Street, which has been altered by the addition of a brick wall. The side of the building which faces Warren St. is of coursed granite rubble. All remaining walls are of uncoursed granite rubble. The second floor is supported by modern pillars which have been wedged under the floor girders without the use of caps or pintles. The remaining floor, as well as the roof, are supported by a series of queenpost trusses, in which the upper chord is of wood and the lower chord is a wrought iron rod, supported by cast iron posts.

(Lowell City Atlas, 1879; Lowell City Directories; Joseph Scannell, President, Fair-grieve Co., Lowell)

C. G. SARGENT MACHINE SHOP
60 Fletcher Street
Lowell

Lowell
19.309900.472337

Around 1852 Charles G. Sargent, formerly of the Lowell Machine Shop, went into business with Messrs. Marvel and Lane in this building and several others which have been destroyed, for the purpose of manufacturing wool burr pickers, and possibly worsted yarn as well. Sargent dissolved the partnership in 1854, but the building continued to be used by Marvel and Lane as a machine shop for the next few years, manufacturing steam engines, printing presses, and textile machinery. In 1879 the building was occupied by the A. L. Brooks Co., manufacturers of wooden furniture. Around 1900 the original building was altered by the addition of 2 extra stories and an ell. These additions were of brick, while the original building was constructed of uncoursed granite rubble. The structure is now occupied by the McKittrick Hardware and Textile Machinery Company.

(HHMC; Lowell Atlas, 1879, 1896, 1906, 1924; Stone)

D. LOVEJOY AND SON, INC.
1 Cushing Street
Lowell

Lowell
19.309860.472340

Daniel Lovejoy began to make knives for paper and leather machinery in 1848 in the machine shop which stands at the corner of Cushing and Fletcher Streets. The business is still in existence. The original shop, which contained furnaces and machine tools, is 40' x 60', single storied, with a pitch roof. It was constructed of uncoursed granite rubble. In 1853 Lovejoy added a second shop and a sizable boiler house to complement the small boiler house and engine next to the original building. This 1853 structure, 90' x 30', was 2 stories, uncoursed granite rubble, with a shallow pitch roof. This

structure burned at an unknown date and was rebuilt as a single story building. An interesting part of the 1848 building is the roof trussing system. The trusses are basically of the queenpost style, but the center panel contains a kingpost truss, and the two outer panels contain additional vertical and diagonal struts. In addition, columns support the trusses directly beneath their center. This unusual system was built with the hope of strengthening the lower chord, to which pulleys and blocks and tackles were attached. (HHMC; Fred Sanville, Manager, D. Lovejoy & Son, Inc., Lowell; Stone)



D. Lovejoy and Son, Inc., Lowell, Massachusetts
(Company letterhead, ca. 1900)

KITSON MACHINE SHOP
Dutton and Kitson Street
Lowell

Lowell
19. 310020. 472342

Richard Kitson constructed the brick 4 story flat roofed building on this site in 1860 and began producing his highly successful cotton picking machines. In 1885 he built an extension to the 1860 shop. In 1905 the shop produced 80% of the picking machines made in America. The Lowell Machine Shop absorbed the Kitson Shop in 1905. The buildings are tenanted today.

(George S. Gibb, The Saco-Lowell Shops (Cambridge, Mass., 1950)

SCANNELL BOILER WORKS
Tanner Street near railroad tracks
Lowell

Lowell
19. 310260. 472222

The Scannell and Wholey boiler works were established in 1880, manufacturing boilers, stand pipes, and fire escapes. About 1900 Wholey retired and Scannell took full control. The business has continued to the present under control of the Scannell family. The buildings date from the years 1900-1950.
(HHMC; Stone)

J. S. TURNER COMPANY
1995 Middlesex Street
Lowell

Lowell
19.306180.472290

The J. S. Turner Company was incorporated in 1903, soon after completion of its wooden and brick mill buildings on Middlesex St. Since 1880 the firm had operated in a small way in a number of locations on Broadway. The company initially manufactured screws and bolts, but about 1906 added a full line of leather belting and began to retail other mill supplies. In 1909 the company moved to smaller quarters in the main mill district of Lowell, and the buildings were vacant until 1915, when the International Steel and Ordnance Company took over operations. In 1920 the Gillespie Eden Electric Washing Machine Co. moved into the buildings, and in 1928 this company was replaced by the Imperial Upholstery Co. The buildings are used as warehouses today. The brick mill is 4 stories, 250' x 50', and is standard mill construction. The one and two story wooden mill is 250' x 50'.
(Lowell City Directories; Lowell City Atlas, 1906-1924)

JOHN PILLING SHOE COMPANY
33 Shaffer Street
Lowell

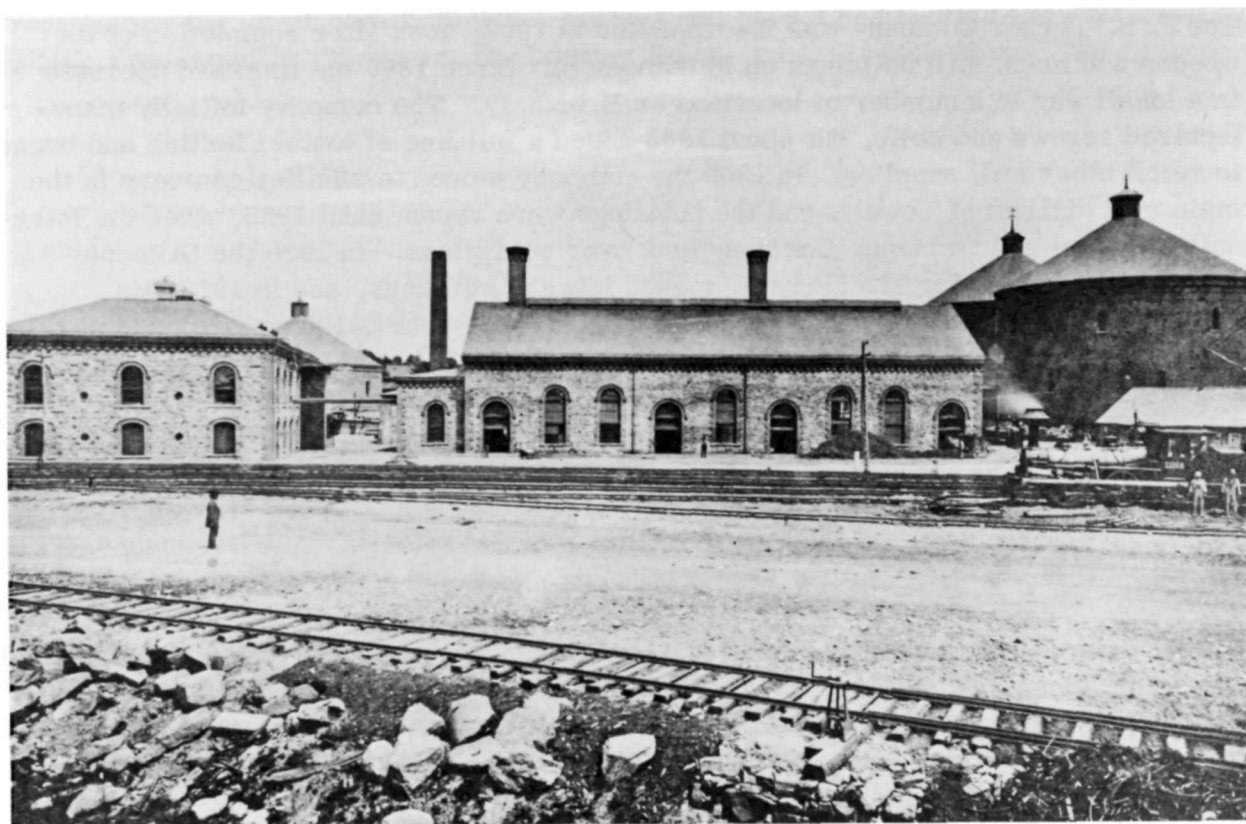
Lowell
19.308880.472362

In 1888 John Pilling Shoe Co. moved to Lowell from Haverhill and began manufacturing shoes for women and children for export to the southern and western states. In 1890 the company employed 125 workers in a 4 story mill of brick construction, with a stair tower and shallow pitch roof, 100' x 35'. The mill was powered by steam. By 1900 the company had added a 4 story ell, 30' x 60', and several smaller buildings were added in the 1920s. During World War I, the company's peak years, it employed about 600 workers. In 1928 this figure had leveled at 350. The company collapsed during the depression and the mill buildings have been tenanted ever since.
(HHMC; Lowell Atlas, 1896, 1906, 1924; Stone)

WHITE BROTHERS AND COMPANY
287 Perry Street
Lowell

Lowell
19.311320.472268

William H. White began his tannery in a very small way in 1863. During the 1870s he occupied a large part of the Belvidere Woolen Company's buildings on Howe Street. In approximately 1890 he built four large and ten smaller structures on Perry St., making him one of the world's largest tanners. White specialized in upper leathers for shoes and other fine leathers for gloves and similar items of apparel. During the years 1898-1900 the White Co. was purchased by new investors and the firm's name changed to the American Hide and Leather Co. Operations continued in both the Howe and Perry St. plants until about 1920, when operations in the Howe Street complex were terminated. After World War II the Perry St. operation was also closed, and most of the buildings are vacant. The buildings themselves are standard mill construction of the late 19th century except for their lack of stair towers.
(HHMC; Illustrated History of Lowell (Lowell, 1897); Parker)



Lowell Gas Light Company, Lowell, Massachusetts, ca. 1880
(Hill, Lowell Illustrated)

LOWELL PUMPING STATION
Hampshire and West Sixth Street
Lowell

Lowell
19.311060.472466

The Lowell pumping station was constructed between 1870 and 1873 as part of a new water system. The brick building, roughly 150' x 150', housed 2 large steam engines, which pumped water from a filter bed located upstream of the Pawtucket Dam, to a reservoir of 30 million gallons capacity. All machinery in place at the pumping station is modern, but the buildings are largely unaltered, consisting of a pair of 2 story brick structures with mansard and pitch roofs. The roof truss of what is now a garage is of some interest, consisting of a queenrod truss the center panel of which contains a kingrod truss. The total span of the truss is 50 feet.

(Lowell Atlas, 1875, 1896, 1906, 1926; Lowell Today; Census, vol. XVI)

LOWELL GAS LIGHT COMPANY
School Street and Western Avenue
Lowell

Lowell
19.309320.472338

The Lowell Gas Light Company was incorporated in 1849, largely through the efforts of Samuel Lawrence, owner of the Middlesex Woolen Mills in Lowell and the Bay State Mills in Lawrence. Gas was manufactured from coal and sold to the mills to illuminate their interiors. From the 1880s onward, the company began to sell its product to light private homes and to fuel stoves. Two buildings of the original plant remain. These are the Purification House and a building of unknown purpose. Both date from about 1850. The Purification House is 2 stories, hip roofed, and constructed of coursed granite rubble. The corbelling, quoins, and window arches are brick, and the combination of materials make the buildings among the most attractive in Lowell. The building immediately north of the Purification House, identified in the City Atlas as building #3, is very similar in construction to the Purification House.

(Hill; HHMC)

LOWELL ELECTRIC LIGHT CORPORATION
107 Perry Street
Lowell

Lowell
19.311220.472308

The first electricity was generated in Lowell at an unknown location in 1881. Two Weston arc lights were used. In 1882 a plant on Middle Street was established, probably generating DC. It absorbed the Weston Co. In 1890 this company, called the Middlesex Electric Light Co., built a new generating plant at 107 Perry St., in Belvidere. The company was reorganized as the Lowell Electric Light Corporation. The generating plant went into operation in 1891. The buildings are now used by Mass. Electric for storage of vehicles and as a distribution station. The engine-generator building constructed in 1891 is largely intact. It is 140' x 45', 2 stories, and constructed of brick. A third story has been added to the western half of the building. This building originally contained 4 steam engines capable of supplying 1250 HP.

(Lowell Today)

RAILROAD TRACK (section) BOSTON and LOWELL RAILROAD	Lowell
at Merrimack Street Bridge	19.310420.472387
Lowell	

In 1912 the Lowell Historical Society preserved a section of tracks and granite sleepers of the Boston and Lowell Railroad, dating from about 1835. The section was removed from the Six Arch Bridge over the Concord, and installed in a section of city property immediately downstream of the Merrimack Street Bridge, opposite the Moody Street Feeder Gatehouse. About 10 feet of track has been preserved. The rails are of the "fish belly" variety of wrought iron tracks which were made and rolled in England. They are laid on cast iron chairs, which are spiked to the 7' x 1' x 1' granite sleepers. Iron wedges secure the rails to the chairs. Each section of track was originally 15 to 18 feet in length.

(COR)

CENTRAL STREET STATION	Lowell
Gorham and Central Streets	19.310720.472344
Lowell	

In 1874 a branch of the Boston and Maine Railroad which connected Lowell with Andover, Newburyport and Portland, Maine, was completed. Benjamin Butler, a prominent citizen of Lowell, lent a good deal of effective support to the project. The depot, with an elaborate neo-gothic facade, is 500' x 100', constructed throughout of brick. The interior is totally masked by virtue of its conversion to a bowling alley. The tracks have been entirely removed.

(HHMC; Lowell Today)

LOWELL AND NASHUA FREIGHT DEPOT	Lowell
Western Avenue	19.309560.472330
Lowell	

This depot of the Lowell and Nashua Railroad was probably constructed around 1870. It is composed of a central office building and 2 wings. Each wing is 1 story, 150' x 60'. The central building is 2 stories, 40' x 60'. The depot appears in the 1876 birdseye view of Lowell, and is essentially unchanged today.

WEIGH STATION	Lowell
near Tanner and St. Hyacinth Streets	19.310300.472230
Lowell	

This weigh station was probably constructed during the 1860s by the Boston and Lowell Railroad to measure the weight of bulk products delivered to the foundries, boiler works, and manufactories that were then being built along Tanner and Plain Streets in South Lowell. The scales have been removed and the scales' location has been boarded up, but the small, 20' x 15'. single story Greek Revival station house survives. Part of the northwest side has been crudely repaired with boards, but the remainder of the building is intact.

Bridges

BROADWAY BRIDGE OVER PAWTUCKET CANAL

Lowell

Broadway crossing of Pawtucket Canal

19.309000.472354

Lowell

This steel arch bridge was erected in 1918 by the Boston Bridge Works for the Proprietors of Locks and Canals, and replaced an 1852 wooden bridge best described as a braced beam design. The arch is anchored to the granite walls of the canal. The span is 64 feet and the rise is 13 feet. The arch is connected by truss work to the deck of the bridge.

(PLCR)

MERRIMACK STREET BRIDGE

Lowell

Merrimack Canal and Merrimack Street

19.310390.472386

Lowell

The Merrimack Street Bridge replaced an earlier bridge of unknown style and dimensions in 1848 as part of the construction of the Moody Street Feeder. The Merrimack Canal passes under the bridge, over which passes Merrimack Street. The bridge abuts the gatehouse of the Moody Street Feeder. The bridge is a single arch granite structure, with a semi-circular arch 32 feet in span and 16 feet in height. The blocks are coursed, and quarry faced. For unknown reasons a section of the arch was replaced in 1890. Only the northern side of the bridge is visible, the remaining side being covered by the YMCA Building.

(PLCR)

BROADWAY BRIDGE OVER WESTERN CANAL

Lowell

Broadway and Western Canal

19.310000.472371

Lowell

The Broadway Bridge over the Western Canal is the oldest surviving highway bridge in Lowell. It is of stone arch construction and consists of a single arch, with a span of 35' and a rise of 12'. It is 20' in width. The bridge was initially constructed of granite rubble without any mortar. The northern or upstream side of the bridge reflects this construction, but the arch of the southern side has been reinforced with mortar and replacement blocks of granite in several places. The deck of the bridge is asphalt, and a modern handrail has been added within the past few years.

(PLCR)

CHURCH STREET BRIDGE

Lowell

Intersection of Church and Andover Streets

19.311140.472338

The Church Street Bridge was constructed in 1857-1858 to replace a floating bridge which had been built in 1841 and washed out by a series of freshets. The bridge was to have been finished in 1857, but one of the arches collapsed at a late stage of con-

struction, and work was not completed until 1858. The bridge has two segmental arches, each 40 feet in span and 15 feet high. The deck of the bridge is 20 feet above the mean water level, and the total span is 150 feet. The bridge is 35 feet wide. Construction was with random coursed, quarry faced granite blocks set in mortar. The pier abutments are also constructed of random coursed granite blocks. (N.A., Illustrated History of Lowell, Lowell, 1897)

ROGERS STREET BRIDGE
Rogers Street at Concord River

Lowell
19.311240.472276

The Rogers Street Bridge was built in 1884 to provide a more convenient access to Lowell railroad depots for the leather companies which were being built along Perry Street during the years after 1870. The bridge has three segmental arches, each with a 40 foot span and a 12 foot rise. The bridge is 150 feet long and 40 feet wide. Construction throughout is of coursed, quarry faced granite blocks, set in mortar. The builder was W.H. Ward. (N.A., Illustrated History of Lowell, Lowell, 1897)

SIX ARCH BRIDGE
Billerica and Denton Streets

Billerica
19.311700.472092

The Six Arch Bridge was constructed about 1832 by the Boston and Lowell Railroad Company to cross the Concord River. It is the oldest railroad bridge in New England. It is a stone arch bridge, consisting of six semi-circular arches, each with a span of 12 feet and a rise of 6 feet. The total span of the bridge is 330 feet, including the wing abutments. The bridge was 35 feet wide before its alteration in 1908. The tracks are 15 feet above the mean water level of the river. The 1908 alteration was extensive. The original bridge, constructed of random coursed granite blocks laid without mortar, was covered by a layer of concrete to an average thickness of 18 inches. Only a small section of the original stone is visible at the western abutment. In addition, a wooden girder bridge was erected on the northern side of the bridge at an unknown date. (COR, vol. 1, no. 3, April 1913)

STIRLING MILLS BRIDGE
576 Lawrence Street

Lowell
19.311230.472246

This bridge across Meadow Brook connects the main mill and power house of the Stirling Mills with the city of Lowell. It is a wood, Queenrod truss through bridge, 30 feet long and 10 feet wide. Wooden verticals have been wedged between the upper and lower chords to supplement the rods. Piers have also been inserted beneath the bridge, so that the truss supports little if any weight. The wooden deck and lower lateral system appear to be original. The upper chord members appear to be connected solely by nails. The bridge dates from about 1880. (FM Survey #8818, 1909)

CENTRAL BRIDGE
Bridge Street at Merrimack River

Lowell
19.311000.472410

The Central Bridge was erected in 1937 following the destruction of an earlier Whipple truss bridge in the great flood of 1936. The cutwater piers and wing abutments of the older bridge were used, and may date from the 1830's, when a covered bridge was constructed by the Lowell Bridge Corporation to connect Lowell with Centralville. The present bridge, built by the American Bridge Company, is a through, rivetted construction, continuous Warren truss with verticals. The bracing for the upper lateral system is also a Warren truss with verticals. Construction throughout is with steel I-beams and lattice girders. The total span is 550 feet, and the width is 50 feet, including two walkways. (Lowell City Engineer's Office)

MOODY STREET BRIDGE
Textile Avenue at Merrimack River

Lowell
19.309440.472456

The Moody Street Bridge was constructed in 1896 by the Groton Bridge and Manufacturing Company. It's designer is unknown. It is a pin connected, lattice girder, deck highway bridge with three Pratt truss spans, for a total length of 750 feet. The central and northern spans are each 300 feet long, and consist of a triple system of Pratt trusses. Each of these spans is 20 feet deep. The southern span is 150 feet long and is only 12 feet deep. The bridge rests upon two pier abutments, a single cutwater masonry pier, and the Northern Canal retaining wall. The bridge received a new deck during the 1950's. (Lowell City Engineer's Office)

PAWTUCKET CANAL RAILROAD BRIDGE
Near Broadway and Pawtucket Canal

Lowell
19.309020.472335

This Baltimore truss, through, rivetted construction, plate and lattice girder, skew bridge was designed by Edward S. Shaw, Chief Engineer of the Boston and Lowell Railroad, in 1883. It was erected by the Boston Bridge Works in 1884. Because it is skewed, the bridge's four chord intersections are bolted to individual granite piers. The longitudinal stringers are also secured to these piers and the chord intersections by massive gusset plates. The stringers are also supported by reinforced concrete pier style abutments, probably installed in 1928. The stringers as well as the girts of the lower lateral system are large plate girders with depths of three feet. Perhaps because of strength of the lower lateral system, the upper system is quite modest, consisting of a web-like system of double diagonals. The span of this parallel chord bridge is 160 feet, and its height is 40 feet. The truss is a double intersection Baltimore design, with four panels but only two diagonals. In the 1883 design, half of the web members were lattice girders, and half were plate girders. In 1928 the Boston Bridge Works replaced all of the lattice girders with plate girders, except for one of the verticals and two of the sub-verticals. (PLCR)

AIKEN STREET BRIDGE
connects Aiken Street and Route 110
Lowell

Lowell
19.310160.472485

The Aiken Street Bridge was constructed in 1883 by the Corrugated Metal Co. of East Berlin, Conn. It is a through, pinned construction, plate girder, lenticular truss bridge. There are 5 spans, each 155 feet in length and 25 feet in depth. The bridge is 32 feet wide, including 2 sidewalks, each 7 feet in width. Each span has 11 panels. The upper chord consists of plate girders riveted together in 8 foot lengths. The lower chord consists of 4 parallel wrought iron bars pinned at 8 foot intervals to each other, the vertical members, and to hangers. The vertical members are lattice girders pinned to the upper and lower chords. The diagonals are wrought iron rods pinned to the upper and lower chords and tensioned by turnbuckles. The lower lateral system consists of iron beams shackled to wrought iron hangers, which are pinned to the lower chord. The stringers and deck rest upon these beams. The upper lateral system consists of wrought iron rods in double diagonals. An additional wrought iron rod runs the entire length of the upper lateral system. There are additional beams below the upper lateral system which are connected to the beams of the upper lateral system by double diagonals. The piers are cutwater style and are constructed of granite blocks. The abutments are of the pier style. The wooden deck was replaced with a steel mesh deck in 1938, and the abutment on the north side of the bridge was reinforced with concrete in the same year.

(Lowell City Engineer's Office; Hill)

HALE STREET BRIDGE
Hale Street at crossing of Boston and Maine Railroad
Lowell

Lowell
19.310220.472261

This bridge, built in 1892, is an inclined chord, pinned construction, Pratt truss with subverticals and substruts, similar to a Baltimore truss. The truss itself is of very substantial construction. The upper chord consists of parallel plate girders connected by a flat bar on the top and lattice plates below. The lower chord is formed by dual parallel plate girders which are pinned to each other and the vertical members. The vertical members in the two end panels are parallel bars of wrought iron. Those of the remaining 4 panels are pairs of channel shaped beams connected to each other by lattice plates similar to those of the upper chord. The diagonals in tension are pairs of wrought iron bars. The substruts and additional diagonals in the 2 central panels are wrought iron rods which are tensioned by means of turnbuckles. There are six panels. The span is 153 feet, the depth in the center panel is 25 feet, and the width is 35 feet, including two sidewalks, each 5 feet wide. The upper lateral system **consists of beams** stiffened by double diagonals made of wrought iron rods tensioned by turnbuckles. The lower lateral system is similar to that of the upper. Many of the double diagonal rods of the lower lateral system have buckled. The stringers are of wood. The abutments are winged, consisting of quarry cut granite blocks cemented in a Flemish bond. The truss has a pronounced slope from west to east, but does not appear to have settled. The deck burned in 1965 and was replaced, as were the stringers and some of the girts.

(Boston and Maine Railroad, Iron Horse Park, Billerica, Mass.)

Specialized Structures

THE WAMESIT CANAL
below Lawrence Street Bridge
Lowell

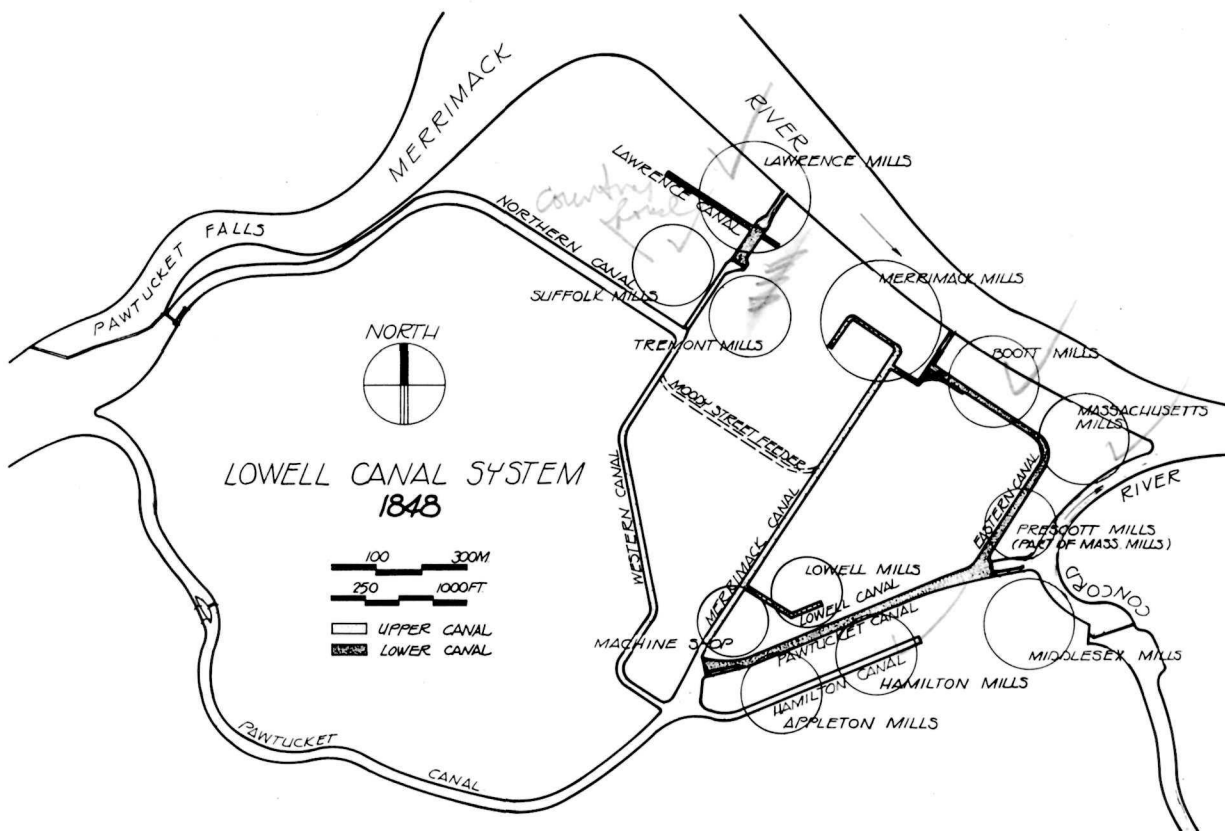
Lowell
19.311480.472200

The Wamesit Canal was constructed during 1821-22, under the supervision of Oliver Whipple, the co-owner of a powder mill on the falls of the Concord River near the site of the Canal. Loammi Baldwin, Jr., was employed as a consultant before the canal was built, and he apparently approved the plans. The Canal was initially about 1,000 feet in length; its width and depth are unknown, but were probably quite modest. The water dropped 25 feet from the canal to the Concord River or to River Meadow Brook, and was used solely for the powder mills. In 1852 Mr. Whipple became ill and he appointed a realtor, Mr. E. B. Patch, as his agent. Patch sold the powder mills and in 1863 widened and deepened the canal to its present dimensions of 20 feet in width and 6 to 8 feet in depth, and extended the canal by 500 feet. In 1865 the canal and most of the water power sites on the canal were sold to the Wamesit Power Co., under the leadership of General Benjamin Butler. The company controlled the affairs of most of the mills which were subsequently built along the Canal, such as the U. S. Cartridge Co. and the U. S. Bunting Co. The Canal is today very similar in appearance to its 1865 state, with the exception that the covered penstock which carried water to the Lowell Bleachery has been totally removed.
(Barlow, No. 3196, 9070, 5432; Meader; D. Prigmore, President, Wamesit Power Co., Lowell; MSS-MVTM)

PAWTUCKET CANAL
flows through Lowell from Pawtucket Dam to Concord River
Lowell

Lowell
19.308770.472402

The Pawtucket Canal was built in 1796 as a transportation canal to avoid the Pawtucket Falls of the Merrimack River. The Middlesex Canal proved so successful that the Pawtucket Canal, a competitor to the Middlesex, was a failure within a few years of its construction. In 1822 the builders of Lowell transformed the Pawtucket into a feeder for the Merrimack Canal, which powered the first of Lowell's large mills, the Merrimack Manufacturing Co. The Pawtucket became a two level canal. The first level, about 30 feet above the lower Merrimack and Concord, flowed from a few hundred feet upstream of the dam to the Swamp Locks, a distance of about 5,700 feet. Locks for barges and a gatehouse were located near the intersection of the canal with Broadway, about 1,700 feet from the upper Merrimack. At the Swamp Locks were a set of locks and a wasteway. The Merrimack Canal joined the Pawtucket at this place. At the Swamp Locks the Pawtucket Canal dropped 13 feet and continued at the lower level, 17 feet above the river, for another 2,150 feet. Here, at the Lower Locks, was another set of locks and a wasteway, at which point the canal dropped into the Concord River. The width of the Pawtucket varies from 80 to 100 feet and the average depth is about 8 feet. Only one mill, the Middlesex Woolen Mills, received water directly from the Pawtucket. The headgates, penstock and tailraces of the system have been filled in. The Pawtucket Canal of 1975 is essentially the same as that of 1825, with the exception of modification in such control areas as the locks and wasteways.
(Mel Lesberg, Manager, PLC; Malone; Census, vol. XVI)



Map of the Lowell, Massachusetts, Power Canal System, 1821-1847
 (U. S. Census, 1880, vol. XVI)

GUARD LOCKS LOCK HOUSE
Pawtucket Canal just north of Broadway
Lowell

Lowell
19.309000.4723600

This building was erected over the upstream pair of gates in 1881, replacing the first building on this site, a functionally similar structure built in 1857. The structure shelters chain and windlass equipment which mechanically assists in opening each of the navigation guard gates. This winding equipment, also built in 1881, replaced similar machinery built prior to 1846. The light wooden frame building has a slate shingled hipped roof. The south corners of the building contain horizontal slots which permit the rotation of the gate lever beams which extend outside the structure.
(Hyde and Parrott; PLCR)

GREAT GATE (FRANCIS GATE)
Pawtucket Canal north of Broadway
Lowell

Lowell
19.309000.472360

The Great Gate was designed by James B. Francis, Chief Engineer of the Proprietors of Locks and Canals, in 1848. It was built between 1848 and 1850. The portcullis gate, of southern pine, is made up of 26 timbers, each 27' long and 17" wide. The gate has been dropped twice, in 1852 and 1936, both times saving the city from serious flood damage. In 1876 protective sheathing was attached to part of the upstream portion of the gate to protect it from floating debris. No other modifications have been made.
(Hyde and Parrott; PLCR)

GUARD LOCKS GATE HOUSE
Pawtucket Canal north of Broadway
Lowell

Lowell
19.309000.472360

This brick gate house, built in 1870, replaced an 1848 wooden structure. The 1848 guard dam replaced an 1832 dam, which in its turn replaced an 1822 dam. The gate house encloses 5 sluice gates, operated by hydraulic lifting machinery. The water pressure was supplied by a 6" main from the Locks and Canals reservoir in Belvidere. The gate house and lifting machinery are essentially intact, with the exception of the three middle cylinders, which were replaced with oil hydraulic cylinders and pistons in 1965.
(Hyde and Parrott; PLCR)

SWAMP LOCKS AND DAM
Pawtucket Canal at confluence with Merrimack Canal
Lowell

Lowell
19.310140.472344

The basic configuration of this complex (two navigation locks and dam at the west end of the upper lock) was achieved in 1822-1823 when the Pawtucket Canal was reconstructed. However, the extant physical works are based on the rebuilding of 1839-1841, when the dam was rebuilt in its stepped configuration and the locks narrowed from 25' to 12'. The lock walls around the 3 gate pockets were done in ashlar, and the remaining chamber walls were constructed of wood, all within the existing 25' rubble locks.

The wooden sides no longer remain although they were periodically renewed. The walls of the upper chamber only were rebuilt in stone masonry to the 12 foot width in 1892. The sluice way on the south part of the dam was probably built in 1841 and the sluice way around the south end of the dam was completed in 1928. A protective light frame house over the length of the crest of the dam and the sluice gate in the dam was constructed first in 1859. Concrete was used to rebuild the north wall of the wasteway in 1942 and the apron on the face of the dam north of the 1841 sluice way in 1946.

(Hyde and Parrott; PLCR)

LOWER LOCKS AND DAM

Lower Pawtucket Canal just east of Central Street
Lowell

Lowell

19.310790.472365

The basic configuration of this complex (two navigation locks and dam at the west end of the upper lock) was achieved in 1822-1823 when the Pawtucket Canal was reconstructed. However, the extant physical works are based on the rebuilding of 1841-1843, when the dam was rebuilt in its stepped configuration and the locks narrowed from 25' to 12'. The lock walls around the 3 gate pockets and the lower portion of the lower chamber were done in ashlar, and the remaining chamber walls were constructed of wood, all within the existing 25' rubble locks. The wood sides no longer remain although they were previously renewed. Due to frequent low water conditions in the Concord River at the low end of the locks, in 1905 the easterly half of the lower lock was deepened about 2.5 feet. In 1910, a 24" pipe was laid from a valve in the canal above the dam, beneath the upper lock, emptying into the lower lock, to drain the lower Pawtucket Canal. The sluice way on the north side of the dam, which was probably built in 1841, was reconstructed in 1887. A protective light frame house has been atop the crest of the dam and over the sluiceway since the late 19th century. Three concrete siphon spillways were built over the dam between 1946 and 1958 (Hyde and Parrott; PLCR)

MERRIMACK CANAL

parallel to Dutton Street
Lowell

Lowell

19.310130.472350

The Merrimack Canal was the first of the power canals to be built by the Proprietors of Locks and Canals. It was intended to power the Merrimack Manufacturing Company with a 30 foot fall of water. Its design was crude; little attention was expended upon creating a uniform section. In some areas the section is rectangular, but in most of the Merrimack the canal has simply been gouged out of the native rock. The canal is 10 feet deep, 2,580 feet in length, and 40 to 50 feet wide. In addition to the Merrimack Manufacturing Co., the canal supplied water to the Lowell Manufacturing Co. and provided the Eastern Canal with water as well after the construction of a wasteway, rolling dam and penstock in the 1840s. Only the Merrimack Canal provides a full 30 foot fall; the other canals provide either a 13 or 17 foot fall. In order to increase the amount of water flowing in the Merrimack Canal, the Moody Street feeder, connecting

the Western Canal with the Merrimack Canal, was built in 1848. The extra water was available in 1848 because of the construction of the Northern Canal in 1847. (Mel Lesberg, PLCR; Malone; Census, vol. XVI)

MERRIMACK CANAL GUARD GATES
Canal at Swamp Locks Basin
Lowell

Lowell
19.310120.472349

These gates were constructed in 1847 to allow the separate draining of the Merrimack and Lowell Canals. The extant gates are a single set of swing gates of massive timber construction that are much heavier than standard navigation gates since they are required to withstand the force of the impounded water the full depth of the gate for extended periods. The operation of these gates was mechanically assisted by chain and windlass equipment, now no longer extant. (Hyde and Parrott; PLCR)

ROLLING DAM
Merrimack Canal near intersection of Kirk and French Streets
Lowell

Lowell
19.310640.472411

The initial construction of this dam took place in 1835 when the Merrimack Wasteway was reconstructed to facilitate wasting from the then new Eastern (Boott) Canal. It provided the intermediate level necessary to vertically align the Merrimack Canal (on the upper level of the system) and the Eastern Canal (on the lower level) so they both could discharge water through the Merrimack Wasteway. This intermediate level was later used to supply water to the Eastern Canal from the Merrimack Canal through the Boott penstock. A house sheltering either a weir or a gate was erected over the dam sometime during the latter half of the 19th century to maintain a water level of sufficient height to adequately feed the Boott penstock. A house remains over the dam, but the device used to control the water level has been removed. There is no evidence that a roller gate of the type generally associated with a "rolling dam" was ever used at this site. It is possible that this name was given to this dam because it was the only one to survive with a curved configuration to its face, although there were, at one time, several of this type in the system. The profile of the dam was slightly altered in 1934 when a concrete facing with iron strap overlay was added which slightly increased its height. (Hyde and Parrott; PLCR)

MERRIMACK DAM
Merrimack Canal near intersection of French and Anne Streets
Lowell

Lowell
19.310570.472413

The dam was built in 1835 when the Merrimack Wasteway was constructed and the Rolling Dam was built to facilitate wasting from the then new Eastern (Boott) Canal. Subsequent changes in the 19th century included a sluice way, and dam house over the sluice way and crest of dam. Two concrete siphon spillways were built on the south side of the dam in 1953. The dam was demolished in 1962 when the Merrimack Mills were razed. At that time, the dam was replaced by a manually operated sluice gate a short distance down the canal. (Hyde and Parrott; PLCR)

YMCA GATES	Lowell
Merrimack Canal near Market and Dutton Streets	19.310350.472378
Lowell	

The YMCA gates were built in 1922, replacing several dams and guard gates erected between 1847 and 1922. The YMCA gates consist of two solid timber portcullis gates which allow the Merrimack Canal to be drained on either side of them when closed in conjunction with the Moody Street Feeder gates or the Merrimack Canal guard gates. No traces of the older control mechanisms survive.
(Hyde and Parrott; PLCR)

HAMILTON CANAL	Lowell
parallel to Middlesex Street	19.310210.472334
Lowell	

The Hamilton Canal was completed in 1826 in order to provide a 13 foot fall of water to the Hamilton and Appleton Mills. The Canal begins at the Swamp Locks and draws its water from the upper Pawtucket Canal. The water flows through the penstocks of the Hamilton and Appleton Mills and is discharged into the lower Pawtucket Canal. Excess water flows from a wasteway at the end of the Hamilton Canal to the lower Pawtucket. The Hamilton Canal is 1,936 feet in length, 10 feet deep, 35 to 100 feet wide, and is rectangular in section.
(PLCR; Malone; Census, vol. XVI)

HAMILTON CANAL GUARD GATES	Lowell
Hamilton Canal adjacent to Jackson Street between King and Revere Streets	19.310170.472334
Lowell	

These gates were originally constructed in 1847 near the head of the Hamilton Canal to allow it to be drained separately. The original gates were replaced in 1853. The extant gates are a single set of swing gates of massive timber construction that are much heavier than standard navigation gates since they are required to withstand the force of the impounded water the full depth of the gate for extended periods. The operation of these gates was mechanically assisted by chain and windlass equipment which was in place at each gate by 1855, when a wooden framed house enclosed the winding equipment on the south bank. Subsequently, a house was built over the equipment on the north bank, but neither are extant, although the winding equipment is.
(Hyde and Parrott; PLCR)

HAMILTON WASTEWAY GATE HOUSE	
end of Hamilton Canal near intersection of Jackson and Central Sts.	Lowell
Lowell	19.310610.472351

The Hamilton Wasteway was first built in 1850 to waste ice from the Hamilton Canal into the Lower Pawtucket Canal. The original gates and gate house were replaced when the wasteway was rebuilt in 1872. The gate operating equipment and the gate

house of 1872 are extant. The 2 gates were originally manually controlled by counterweighted rack and pinion machinery. The gate house is located at the head of the brick vaulted wasteway. Manual operation was replaced with electric motor drive that was added to the original equipment early in the 20th century. (Hyde and Parrott; PLCR)

LOWELL CANAL

Lowell

150 meters north of Swamp Locks, off Merrimack Canal
Lowell

19.310240.472355

The Lowell Canal was constructed in 1828 to provide power for the Lowell Manufacturing Co. It draws its water from the Merrimack Canal. Water from the Lowell Canal dropped 13 feet through the wheels of the Lowell Mfg. Co. and exited into the Lower Pawtucket Canal. The Lowell is 500 feet in length, 30 feet wide, and averages 10 feet in depth. It is rectangular in section. The canal was covered in 1880 by the Brussels Carpet Weaving Mill of the Lowell Manufacturing Company. (PLCR: Malone; Census, vol. XVI)

WESTERN CANAL

Lowell

Dutton Street northwest to Merrimack River
Lowell

19.310040.472338

The Western Canal was built in 1831-1832 as a 2 level water power system for the Tremont and Suffolk Mills, on the upper level, and the Lawrence Mills on the lower level. Locks were initially constructed in the Western to enable barges to reach the textile mills, but these locks were filled in during the 1840s; the remnants of the locks at the Hickey Hall Dam are still visible. The Western initially drew its water from the upper Pawtucket Canal, above the Swamp Locks, and flowed in a northerly direction to the Tremont-Suffolk Mill complex. These mills, on opposite sides of the Western's upper level, drew practically all of the water through their wheelpits, a fall of 13 feet, and discharged the water into the Lawrence Canal, a spur of the lower level of the Western. Any water which did not flow through the penstock of the Tremont and Suffolk Mills flowed through the wasteway of the Western Canal and fell into the Western's lower level, where it joined the Lawrence Canal. Water from the lower level of the Western as well as the Lawrence Canal dropped 17 feet into the wheelpits of the Lawrence Mills, and discharged into the Merrimack River. A wasteway constructed just below the intersection of the Lawrence and lower level Western, carried excess water into the Merrimack River. The construction of the Northern Canal in 1847 radically altered the role of the Western Canal. The Northern delivered all of its water into the Western at the headgates of the Tremont and Suffolk Mills, and the mills now drew their water directly from the Northern. The lower level of the Western-Lawrence canals remained unchanged. The upper level of the Western, however, was greatly altered. The flow of the Northern reversed the direction of the upper Western's current, and the upper Western became a feeder for the upper Pawtucket, thus providing extra water for the Merrimack, Hamilton and lower Pawtucket. The Moody Street Feeder, finished in 1848, also drew its

water from the upper Western and delivered it to the Merrimack Canal. This arrangement is followed by the present operators of the Lowell Canal system. The total length of the Western Canal is 4,964 feet. Its width varies from 35 to 55 feet, and its average depth is 9 feet.
(PLCR; Malone; Census, vol. XVI)

HICKEY HALL LOCKS AND DAM (Hall Street Dam or Tremont Dam) Lowell
Western Canal at intersection of Suffolk and Hall Streets 19.310230.472436
Lowell

As first constructed in 1831, this site included a dam which maintained the upper level of the Western Canal, and a flight of two navigation locks which provided access to the Lawrence Manufacturing Company's mills. In 1845, the dam was rebuilt into its present stepped configuration. As a result of changes in the system caused by the Northern Canal project, the locks were removed in 1848 and the upper chamber opening sealed to the height of the dam. This action was taken since the dam was not rebuilt to accommodate the new upper level. Instead, in order to maintain the new level, the Western Canal below its confluence with the Northern Canal was blocked by some form of dam or gates at the site of the Tremont Gate House, making navigation to the Lawrence Mills no longer possible. In 1868, the dam was cut down 2 feet in order to increase the supply of water directly into the Lawrence Canal when the Tremont and Suffolk Mills were not in full operation. A sluice way was then built in the dam next to the former lock chamber wall about 1870.
(Hyde and Parrott; PLCR)

LAWRENCE DAM Lowell
Lawrence Wasteway at intersection of Suffolk and Perkins Streets 19.310300.472446
Lowell

This waste dam was initially constructed in 1831 when the Lawrence and Western Canals were built. It maintained the level of the Lawrence Canal. It was probably rebuilt in its present stepped configuration in the 1840s, the period when most of the other dams on the system were similarly reconstructed. The sluice way probably dates from the same period. The frame house that was located over the sluice way was built in the latter part of the 19th century. In 1913, the cast iron flash board standards were replaced and raised one foot, as was the sluice gate house. The house was not extended the full length of the dam until the 3 siphon spillways, which required insulation, were built in 1948-1949. The entire building along the crest of the dam burned in 1965.
(Hyde and Parrott; PLCR)

TREMONT GATE HOUSE Lowell
Western Canal at Suffolk Street and French Street Extension 19.310140.472422
Lowell

This gate house along with its gate operating equipment was built in 1855, replacing the temporary installation of 1847 that was built as part of the Northern Canal project. Its purpose was to permit the supply of water directly into the Lawrence Canal from the Northern Canal, if necessary. Normally, the Lawrence Canal was supplied with

water through the tailraces of the Tremont and Suffolk Mills. The gate house contains two offset sluice gates which are each manually operated with counterweighted rack and pinion equipment. Manual operation was replaced with electric motor drive that was added to the original equipment early in the 20th century.
(Hyde and Parrott; PLCR)

WESTERN CANAL GUARD GATES	Lowell
Western Canal at intersection of Moody and Suffolk Streets	19.310030.472408
Lowell	

These gates were constructed in 1848 to allow the draining of selective parts of the canal system in conjunction with gate closings on other parts of the system as required. This was done by a double set of swing gates in the Western Canal between the Swamp Locks Basin and the entrance to the Moody Street Feeder. The gates, located back-to-back, open in opposite directions. Only one pair of gates was closed at a given time, depending on the portion of the system to be drained. These massive timber gates are much heavier than standard navigation gates since they were required to withstand the force of impounded water the full depth of the gate for extended periods. The gates were manually operated with chains from their ends rather than with lever beams. One of the four gates was broken off in 1960 and rests in the bottom of the canal at the entrance to the Moody Street Feeder.
(Hyde and Parrott; PLCR)

EASTERN CANAL	Lowell
from lower locks of Pawtucket, parallel to Bridge Street, then parallel to French Street	19.310750.472368
Lowell	

The Eastern Canal was constructed in 1835 as a single level canal to power the Prescott, Massachusetts, and Boott Mills. The Eastern began just above the wasteway and locks of the lower Pawtucket Canal, and ran for 2,037 feet, providing water with a 17 foot drop to the Massachusetts, Prescott, and Boott Mills, which discharged the water into the Concord and Merrimack Rivers. The Eastern averaged 8 feet in depth, 40 to 65 feet in width, and was rectangular in section. Additional water for the Eastern was supplied from the Merrimack Canal, which was connected by a penstock to the Eastern at the wasteway of the Eastern. Excess water from the Eastern flowed through this wasteway and into the Merrimack River.
(PLCR; Malone; Census, vol. XVI)

BOOTT DAM	Lowell
Eastern Canal near intersection of Kirk and French Streets	19.310670.472411
Lowell	

This dam was originally built in 1835 to control the level of the Eastern Canal, completed at the same time. Its face was in a curved configuration and its crest was topped with flashboards. In 1878, a sluice way with portcullis gate was built into the

dam to facilitate the removal of ice from the Eastern Canal. The face of the dam was probably rebuilt into its present stepped configuration and the first enclosing structure built over it at that time. In 1892, the house was rebuilt to accommodate a hydraulic lift on the sluice gate. This house and its gate machinery are extant. Subsequently, three concrete siphon spillways were added. The pair on the south side of the dam was constructed in 1948, and the one on the north side at about the same time.

(Hyde and Parrott; PLCR)

BOOTT PENSTOCK	Lowell
between Merrimack and Eastern Canals near Kirk and French Sts.	19.310640.472411
Lowell	

The Boott Penstock was built in 1846 to supply water to the Eastern Canal from the Merrimack Canal. It was enlarged in 1848 and again in 1873. In 1889 an extension to the penstock was built, designed to reduce problems of turbulence and icing in the Eastern Canal. The modification was a channel run parallel to the Eastern Canal and connected to it by 15 underwater orifices through a masonry wall. An iron penstock gate house was added in 1906.

(Hyde and Parrott; PLCR)

MASSACHUSETTS WASTEWAY GATE HOUSE	Lowell
Eastern Canal at East side of Bridge Street	19.310910.472397
Lowell	

This wasteway and its gatehouse were built in 1862 to facilitate the removal of ice from the Eastern Canal. The original small wooden framed gatehouse at the entrance, which contains four bays of flashboards, is extant. In 1883, the wasteway was lengthened when the Massachusetts Yard was extended about 26' to the newly established river line.

(Hyde and Parrott; PLCR)

NORTHERN CANAL	Lowell
begins above Pawtucket Dam, ends at intersection of Francis and Suffolk Streets	19.309000.472430
Lowell	

The Northern Canal was designed by James B. Francis, Chief Engineer of the Proprietors of Locks and Canals, as a feeder to supplement the Pawtucket Canal. Built simultaneously with the dam across the Merrimack, the Northern was also intended to raise the total head available at Lowell by 3 feet, since it reduced velocity and friction losses throughout the canal system. The canal is rectangular in section and has only one major curve, thus allowing the water to flow in as smooth a manner as possible. It is 4,373 feet in length, averages 100 feet in width and is 15 to 21 feet in depth, depending upon the width of the canal at a given point.

(PLCR)

GREAT RIVER WALL
Northern Canal along Merrimack River
Lowell

Lowell
19.309350.472445

The Great River Wall was built as a retaining wall for the upper Northern Canal in 1846-47. The wall is about 2,300 feet long, and is largely built of random coursed granite rubble laid in cement. About 700 feet of the wall was erected on an island formed by the excavation of the canal. As a result of the 1936 flood, about 100 feet of the lower river wall was replaced with a concrete plug.

(Hyde and Parrott; PLCR)

NORTHERN CANAL GUARD GATES (Pawtucket Gate House)
Merrimack River at School Street
Lowell

Lowell
19.308940.472426

This site contains the guard sluice gates, their brick gate house, and a navigation lock, all part of the northern canal construction project of 1846-1847. The ten sluice gates were operated by a mechanical system that consisted of a turbine located in a chamber beneath the deck of the School Street Bridge which transmitted power to the two hoisting screws on each gate. Most of the original equipment, including the Francis turbine, is intact. Alterations include a water tight enclosing wooden cover in the turbine pit in 1872 to prevent flooding of the turbine chamber in high water. Also, the line shaft was replaced in 1881, and the smaller belt pulleys replaced in 1883 by friction pulleys and clutch mechanisms which allowed independent operation of each gate. Early in the 20th century, electric motors replaced the turbine as the line shaft's prime mover. These motors were subsequently replaced by individual motors at each gate. The navigation lock has not been used since 1871 when a wooden bulkhead was built to close the lock. This bulkhead was replaced by a concrete wall in 1939.

(Hyde and Parrott; PLCR)

NORTHERN CANAL WASTE GATES (High Bridge Gate House)
Northern Canal below Moody Street Bridge
Lowell

Lowell
19.309500.472453

This site, which comprises the downstream end of the Great River Wall, originally included four waste gates and their manually powered operating machinery, along with a waste weir divided into multiple bays by cast iron standards. These works were completed in 1847 as part of the Great River Wall project. Major modification took place in 1872 when one of the scouring holes was converted into a wheel pit where a turbine was installed to power mechanical gate operating equipment which was added atop the original manually operated mechanisms. At the same time, a flat roofed heavy timber framed building was erected over the waste gates, and a hip roofed light timber framed building was built over the waste weir.

(Hyde and Parrott; PLCR)

MOODY STREET FEEDER	Lowell
parallel to Moody Street between Suffolk and Denton Streets	19.310060.472410
Lowell	

The Moody Street Feeder was built as part of the Northern Canal project and, like the Northern, was designed by James B. Francis. The Feeder drew water from the upper Western Canal and delivered it to the Merrimack Canal, where it could be used to meet the needs of the Merrimack Manufacturing Co. The Merrimack Canal, so provided with water by the Feeder, was also used to supply the Eastern Canal with water, by means of a penstock constructed in the years 1846-48. The Feeder is 1,418 feet long, 30 feet in width, and 10 feet in height. The feeder is divided into three parts by two longitudinal walls, forming the piers for 3 arches, which close the conduit on top. The segmented arches are made of brick. The piers and sidewalls are granite. (Malone; PLCR; Census, vol. XVI)

MOODY STREET FEEDER GATE HOUSE	Lowell
Merrimack and Dutton Streets	19.310830.472390
Lowell	

The Moody Street Feeder Gate House was completed in 1848 as part of the Feeder itself. The house contains three manually operated sluice gates equipped with counterweighted rack and pinion equipment. This equipment is original except for the counterweights, which were added in 1853. (Hyde and Parrott; PLCR)

LOCKS AND CANALS RESERVOIR	Lowell
block bounded by Belmont Avenue, Fairmont and Summit Streets	19.312080.472282
Lowell	

This 150 foot square, 12 foot deep reservoir was built in 1849 by the Proprietors of Locks and Canals to store water for the fire protection of the mills. It stores almost 193,000 cubic feet of water. A small building near the west corner of the reservoir controls the 12 inch supply main. The reservoir also supplied water for hydraulic gates at the Guard Locks and Boott Dam. Originally filled by pumps in the mills, the reservoir is now supplied from a pump at the Swamp Locks. (Hyde and Parrott; PLCR)

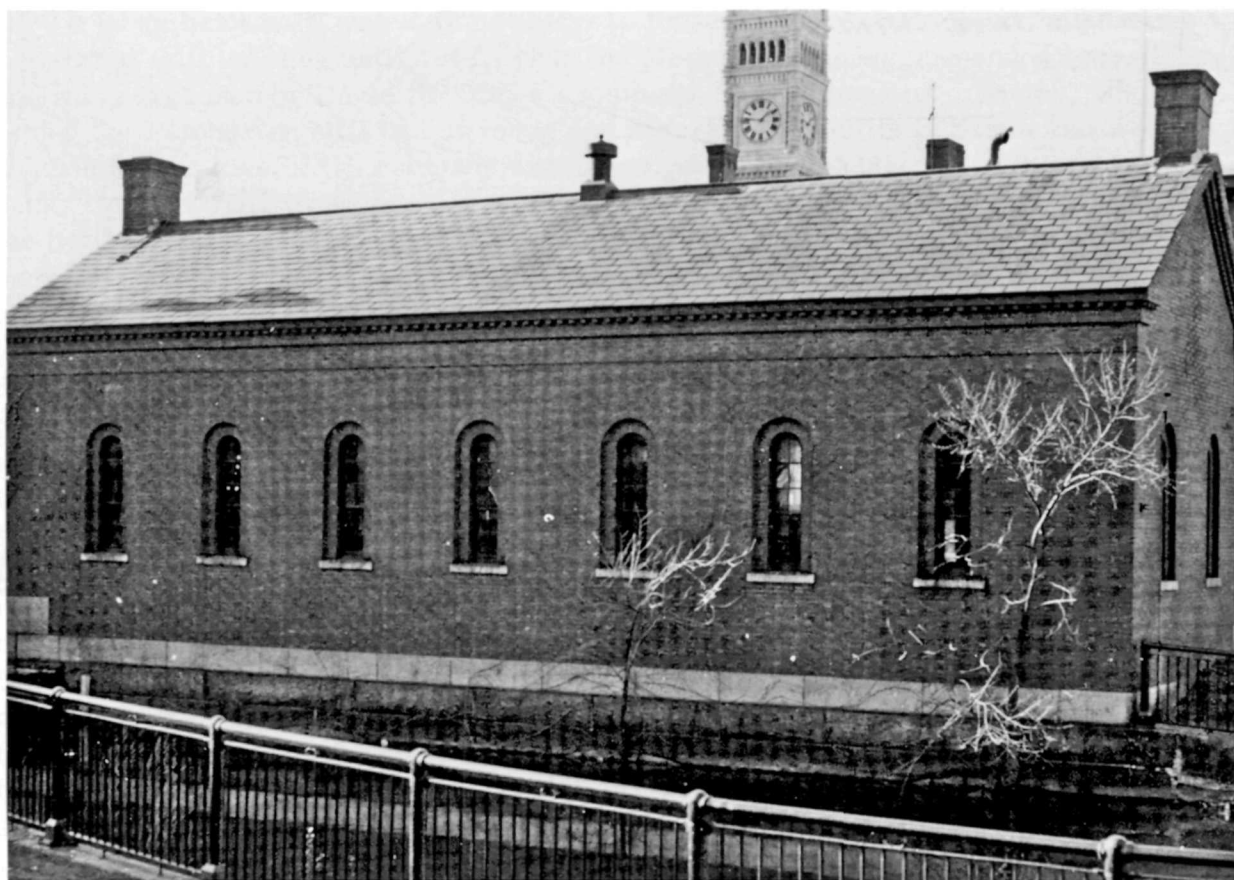
PAWTUCKET DAM	Lowell
Merrimack River above School Street	19.308800.472423
Lowell	

This masonry dam was built in 1847 and 1875, replacing earlier masonry and wood dams of 1826 and 1833. The dam follows the outline of the natural ledge of the Falls. The foundation of the dam consists of granite blocks laid in a trench. The face of the dam is constructed of quarry faced granite blocks, and the interior is granite rubble set in hydraulic cement. The dam has no spillway. Its crest averages 15 feet in height above the ledge of the Falls, depending on the contour of the river bottom.

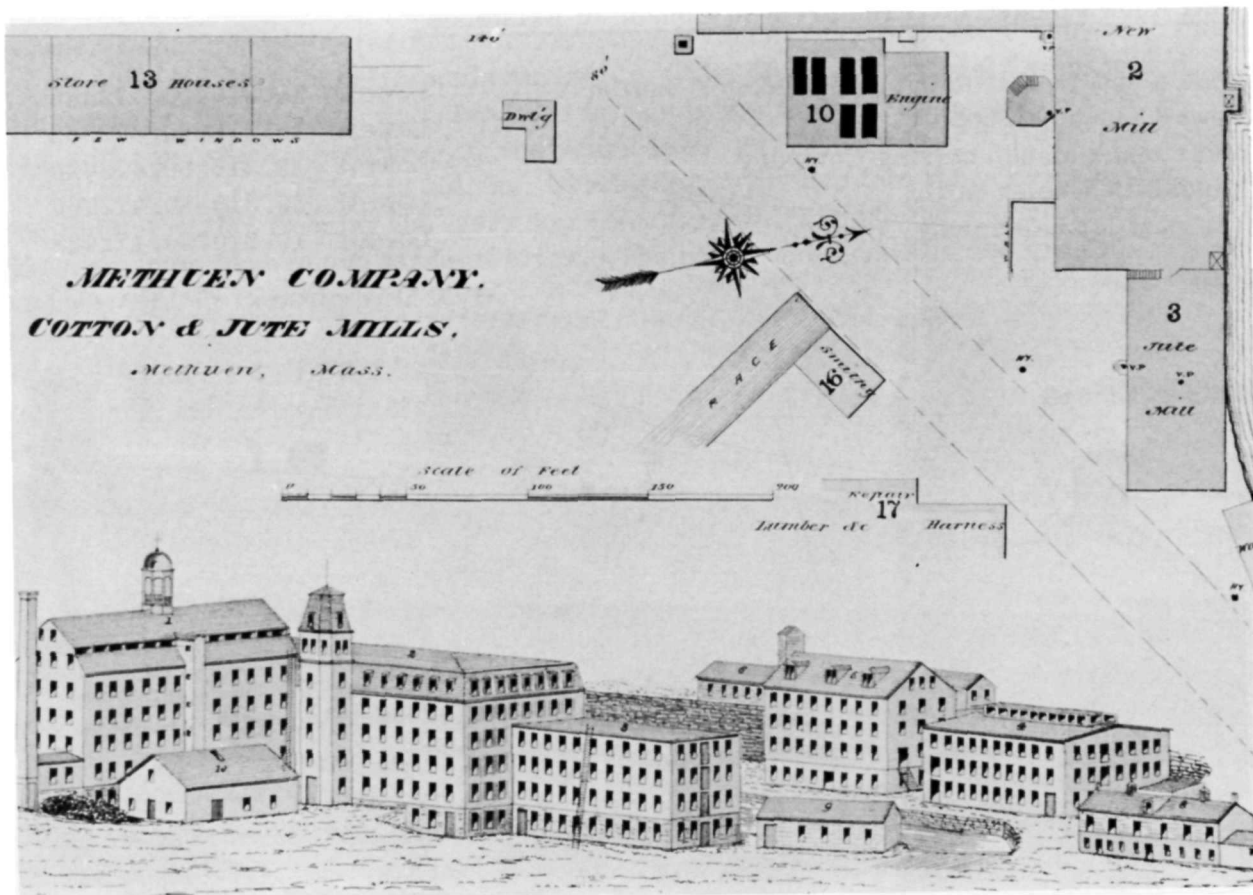
With its flashboards in place, the dam is capable of ponding the river for a distance of about 18 miles. The dam is 1,093.5 feet in length. The fishway was built in 1921. (Hyde and Parrott; PLCR)

Well Known Industrial Structures No Longer In Existence

Boston and Lowell Railroad Passenger Station	Lowell	19.310400.472386
Lowell Machine Shop	Lowell	19.310240.472356
Merrimack Manufacturing Company	Lowell	19.310580.472420
Middlesex Woolen Mills	Lowell	19.310880.472360
Tremont Manufacturing Company	Lowell	19.310240.472428



Moody Street Feeder Gatehouse, Lowell, Massachusetts
(Photo by author, 1975)



Methuen Company, Methuen, Massachusetts, in 1877
 (Barlow Insurance Survey, MVTM Collections)

METHUEN

Bulk Products Industries

METHUEN COMPANY
51 Osgood Street
Methuen

Lawrence
19.320760.473266

The Methuen Company was organized in 1821 on the site of the Stephen Minot Cotton Mill, which had been erected about 1814 and burned in 1818. As early as 1709 the mill site, on the falls of the Spicket River, had been the location of a grist mill. In 1826 a large brick mill was built, similar to those in Lowell, and this remained the only large mill building until 1864, when the Methuen Company suspended operations and was purchased by David Nevins, a prominent Boston investor. Nevins, who owned the Pemberton Mill in Lawrence and several other mills in Salem and Webster, quadrupled the size of the company during the years 1870-1881. In addition to cotton duck, tickings and awnings, Nevins added a line of jute bagging, but after his death the owners of the mill removed the jute machinery. The company continued in operation until the 1930s, when the properties were rented to a number of small industries. The Methuen Company Dam was probably built during the expansion years of 1864-1880. An 1835 lithograph of the mill does not show any trace of a dam. An 1877 insurance survey shows a dam about 30 feet upstream of the present dam. The present dam made of quarry cut granite blocks, crosses the river in four angular increments, with stone abutments, situated on the mill pond to supplement the wing walls. Wastegates operated by rack and pinion mechanisms have been built in these abutments. There is no spillway, and the face of the dam appears to have little if any batter. The dam averages about 15 feet in height. The total fall available was some 40 feet with the 3 foot flashboards installed. There were 2 headraces, one on either side of the river. Both supplied water to factories of the Methuen Company. In 1899 there were 4 turbines in place, providing the mill with an average of 600 HP during periods of adequate rainfall. The tailrace for the mills on the south side of the river was a masonry tunnel which ran several hundred feet to the next mill pond below that of the Methuen Company. All mill buildings constructed since 1826 have survived without major alteration. Chief among these is the 1826 mill, a 4 story brick building with a clerestory monitor roof and a wooden and brick stair tower. The mill is 150' x 55'. The windows of the roof have been covered with shingles, the mill's cupola has been removed, and parts of the building have been painted. The first story of the mill has also been modified to contain plate glass windows and modern doors. A cotton spinning mill of 3 stories and a basement, dating from about 1840, and located on the north side of the river is intact, except for the loss of its pitched roof. A brick storehouse located on the Boston and Maine Railroad tracks about 100 meters southwest of the 1826 mill was probably built around 1850, when the railroad was constructed. It is a single story brick building with pilaster

style walls and a pitch roof with globe windows at either end. It is very similar to storehouses built at Lowell and Lawrence in the years 1830-1850. It is 40' x 15'. The 1870-1876 addition to the 1826 mill consisted of a 5 story brick building, 165' x 100', with a mansard roof and an octagonal stair tower with a mansard roof. A 3 story flat roofed building, 110' x 50', was added to the eastern end of the mill, and around 1885 2 stories were added to this building, including a mansard roof. The basements of the 1826 and 1870 mills were constructed of stone masonry. These later mills have survived almost intact. A brick single story boiler and engine house was built around 1870 and was enlarged around 1885. A brick 3 story mill with a monitor roof was built around 1870 on the north side of the river below the wooden spinning mill. It was initially used as a jute mill. A large brick structure of 2 stories, 200' x 50', was built opposite the 1826 mill in the years 1870-1875. The final addition to the complex was a 2 story brick picker house, on the west side of the 1826 mill, completed in 1882. This complex is the best preserved textile mill site in the lower Merrimack Valley.
(Barlow, No. 3986; HHEC; Stone)

NEWBURYPORT

Bulk Products Industries

JAMES STEAM MILL
Water, Salem and Charles Streets
Newburyport

Newburyport East
19.347320.474080

The James Steam Mill is the only surviving textile mill in Newburyport. It was built in 1842 by Charles T. James of Providence, Rhode Island, who also erected and ran the Peabody and Ocean Steam Mills, which are no longer standing. The mill was entirely powered by steam engines, and manufactured sheetings, and shirtings. In 1871 the name of the mill was changed to the Masconomet Mills, and in 1876 the name was changed again to the Victoria Mills. In 1876 the mill contained 17,000 spindles and 350 looms. In 1907 the mills were purchased by Patrick Tracy Jackson IV and others, and the new company, called the Bay State Cotton Corporation, manufactured yarn only. The mills suspended operations during the 1930s and have been tenanted ever since. The buildings are well preserved and largely unaltered. The main mill is an attractive 4 story brick pitch roof building with skylights and two stair-water towers, one of which has a weather vane designed as a gear train. The building is 300' x 50'. The picker house, which faces on Salem Street to the west of the boiler house, was probably built at the same time as the main mill. It is 2 stories, brick, with a steep pitch roof and skylights. It is 100' x 50'. The boiler and engine house appear to date from the 1870s or early 80s. The 4 boilers inside date from 1881. The cotton storehouse to the west of the picker house dates from about 1890. It is 4 stories with a shallow pitch roof and follows the standard design for storehouses of the period 1880-1910. It is 100' x 55'. The combing building, adjoining the main mill on Water Street, dates from about 1900. It is 50' x 75'.
(HHEC; Newburyport City Atlas, 1914; Stone)

Manufacturing Industries

ALBERT RUSSELL AND SON COMPANY IRON FOUNDRY
105-97 Merrimac Street

Newburyport West
19.346540.474154

In 1840 Robert Russell and Eleazer Walker established an iron foundry and machine shop on this site and began to manufacture equipment for the shipbuilding industry, especially pumps, windlasses, and capstans. These items attained a national reputation. The company prospered under various members of the Russell family, switching production to that of bronze plaques in 1906. In 1928 the company, with 75 hands, manufactured large numbers of bronze memorial tablets. The company went out of business during the 1930s and most of the buildings were purchased by the town. Two of the 1840-1850 era machine shops, which face Merrimac St., survive, although altered. The two story, brick pitch roof shop on the corner of Merrimac and Strong Streets is largely intact. It was sold to a grocer in 1910. The shop now occupied by the public works department of Newburyport was largely destroyed, only the office section remaining. At an unknown date the pitch roof was crudely converted to a gambrel roof. The original wooden foundry behind the machine shop was replaced by a brick foundry sometime after 1914. It is now used as a town garage.

(Newburyport Atlas, 1914; Stone)

TOWLE SILVER MANUFACTURING COMPANY
174 Merrimac Street
Newburyport

Newburyport West
19.346180.474208

In 1857 A. F. Towle and W. P. Jones began silversmithing in Newburyport. In 1870 E. P. Towle was admitted to the firm. In 1873 Jones dropped out and the Towles took over sole control, manufacturing silverware and cutlery in two small wooden buildings, now destroyed, near the present plant. The business prospered, and in 1880 the firm moved into the buildings of the defunct Merrimack Arms and Manufacturing Company, which had been erected in 1866. The Towle Company has continued operations in this and additional buildings to the present day. The 1866 mill is 4 stories, with a shallow pitch roof, constructed of brick, with a stair tower which is covered with a very handsome mansard roof. It is 150' x 45'. Two 20th century additions have been made to this mill, the walls of which are similar in style to the 1866 building. An ell on the river side of the main mill, 100' x 100' x 50', dates from about 1870. Two large water towers, each with cisterns of capacities of 30,000 gallons, were added around 1910. A wooden store house and machine shop, on the river side of the main mill, dates from about 1880. It was covered with a layer of cement on lath around 1900. It is 3 stories, with a shallow pitch roof, 100' x 35'. A concrete water vat on the bank of the river dates from after 1920.

(Stone)

DODGE, BLISS AND PERRY SHOE COMPANY
Prince Street between State Street and Hale Court
Newburyport

Newburyport East
19.346400.474115

This is the largest and oldest of the surviving shoe manufacturing factories in Newburyport. In 1866 Nathan D. Dodge began to manufacture cheap women's shoes in a building on this site, and the business prospered and expanded. Dodge engaged in a number of partnerships, the most enduring of which was that with Charles A. Bliss and Walter I. Perry. In 1892 Dodge moved to a separate wooden building on this site, and Bliss and Perry occupied the remaining 4 buildings. This situation continued until the 1930s, when the entire complex of factories closed. They have been tenanted ever since. Of the surviving buildings, the four story, 300' x 50' brick structure with a mansard roof and elaborate Italianate facade (on Pleasant St.) is the most impressive. It is divided into 3 compartments, of which the oldest (about 1866) faces Pleasant St. The section which faces Prince St. has an adjacent boiler and engine house the chimney of which is dated 1880. To the right of this main building, heading toward State St. on Prince St., is a brick 150' x 50' four story building which was originally part of the Bliss and Perry Co. but was taken over by the Bracket Heel Co. around 1910. It appears to date from about 1880. The N. D. Dodge Co. building faces Prince St. near Hale Court. It is a wooden building, 3 stories high with a flat roof, 200' x 50'. The side of the building which faces Prince St. has been covered with a layer of plaster. (Newburyport Atlas, 1914; Stone)

Transportation

NEWBURYPORT LIGHTHOUSE
63 Water Street
Newburyport

Newburyport East
19.347000.474122

This lighthouse was probably constructed soon after the fire of 1811. It may have been increased in height at a later date. It is brick and square in shape. The lower 16 feet is 7.5 feet wide on a side, and tapers upward to 6 feet on a side. The upper 15 feet of the lighthouse is 6 feet wide on a side with no taper. The brick is a different shade from that of the lower 16 feet. Atop the tower is a round, cast iron platform and lantern house, with a functional but attractive handrail. The light has been removed. The lighthouse is in use today as a range marker for the channel of the Merrimack River at Newburyport.

Bridges

WHITTIER MEMORIAL BRIDGE
Route 95 and Merrimack River
Newburyport

Newburyport West
19.343800.474400

This attractive 5 span deck truss and steel arch riveted highway bridge was completed in 1954 as part of the Route 95 Interstate system. It is 60 feet wide and 1,100 feet in length. Four of the spans are triple systems of Warren trussed steel I-beams

with verticals. Each span is 210 feet long. The span over the navigation channel of the Merrimack is a steel arch reinforced with a deep triple system of Warren trusses. The deck is suspended from steel cable wires attached to the arch. The pier abutments are of ashlar.

(Mass. DPW)

ESSEX SUSPENSION BRIDGE
connects Deer Island and Newburyport
Newburyport

Newburyport West
19.344140.474390

The first bridge at this site was constructed in 1792 under the direction of Timothy Palmer of Newburyport. It consisted of 2 wooden Palladian arch spans, each anchored on one end by Deer Island and on the other by the Salisbury and Newburyport banks of the Merrimack River. The arch at the Salisbury side had a span of 113 feet, while that of the Newburyport side had a span of 160 feet. In 1810 the arch on this latter side was replaced with a suspension bridge based on the design of James Finley of Fayette County, Pennsylvania. It is not known how long the wooden arch on the Salisbury side stood. A steel girder bridge dating from about 1960 stands on what appears to be the 1792 stone abutments. The suspension bridge had a span of 240 feet. It consisted of 2 massive pier abutments of doweled granite blocks, weighing 4,000 tons, upon which were placed 2 towers constructed of coursed granite blocks. Each tower had two segmental arched passageways, of unknown width. Two separate flooring systems passed through these arches. Ten chains, each 516 feet in length, were anchored to the ground, passed over the towers, and connected by suspenders to the girts of the flooring system. In 1826, under a heavy snow load and in conditions of extreme cold, 5 of the chains snapped, dropping the deck (and one oxcart) into the Merrimack. In 1827 the bridge was rebuilt with 12 chains, and the 2 flooring systems were made independent. The next modification occurred in 1894, when some of the chains were replaced with steel wire cables, and a Howe stiffening truss was installed, as well as a new flooring system. In 1909 the entire bridge, with the exception of the abutments, was demolished and the present suspension bridge was constructed by the Holbrook, Cabot and Rollins Corp. of Boston, with George Swain as consulting engineer. The towers of this bridge are the same shape as those of the original bridge, except that they are constructed of reinforced concrete and have single segmental arched spans. The deck is stiffened by four spans of Warren trusses with verticals, and is suspended from four 3.5" wire cables which are connected to reinforced concrete anchors. The suspenders are single 1.25" wire cables connected to both suspension cables and joined to the deck girts by means of a steel pulley. The suspenders are tensioned by turnbuckles. The bridge is 30 feet wide with a 3 foot wide pedestrian walk.

(Engineering News, Vol. 66, No. 5, Aug. 3, 1911, pp. 129-132; Sept. 25, 1913, pp. 585-6)

HIGHWAY BRIDGE
Route 1 between Salisbury and Newburyport
Newburyport

Newburyport East
19.346450.474170

This highway bridge was erected in 1902 by the Boston Bridge Works. Its designer

was Edwin Thacher of New York City. It is an inclined chord, riveted, lattice and plate girder, through bridge with five 208 foot spans. The truss is an odd variation of a Warren Truss with verticals, subverticals and substruts. The 3 center panels resemble double intersection Warren trusses while the outer panels are pure Baltimore trusses. The central span is mounted on a turntable the diameter of which is 30 feet. The piers of the bridge consist of cast iron caissons filled with concrete and resting atop piles in the bed of the river. They are braced with double diagonals. Apparently their emplacement was faulty, because the bridge has shifted almost two feet downstream since 1902. The lateral systems of the bridge are quite sturdy. The upper system consists of double diagonal lattice girders and I-beam girts. The lower system consists of I-beam girts and stringers. The deck is a steel mesh. The wing abutments are constructed of granite blocks. The bridge is in the process of being destroyed. It has been replaced by a newly constructed steel and concrete girder bridge with a bascule draw mechanism.
(Engineering Record, vol. 50, No. 8, Aug. 20, 1904, pp. 218-221; Mass. DPW; conversation with gate keeper of 1902 bridge)

NEWBURYPORT RAILROAD BRIDGE
near Bridge Road and Merrimack River
Newburyport

Newburyport East
19.346400.474174

This deck railroad bridge with a swing span was built in 1888, replacing a wooden bridge. The designer was Theodore Cooper. It consists of a triple system of pin connected Pratt trusses, with wrought iron rods and bars used as web members, and wrought iron bars in the chords. There are seven spans, each 140 feet in length. The swing span was mounted on a steel turntable and was mechanically operated. In 1922 the bridge was strengthened by the addition of a double system of plate girder Warren trusses with verticals connected to the original Pratt truss by plate girder struts. The turntable was motorized with electric power at this time. The bridge is 25 feet wide. The piers are double cutwater design, because the river is tidal at this point. The wing abutments and piers are constructed of granite blocks set in mortar, and date from 1888. The bridge is no longer in use.
(Engineering News, 1922; Boston and Maine Railroad, Billerica, MA)

Specialized Structures

CALDWELL'S DISTILLERY
182 Merrimac Street
Newburyport

Newburyport West
19.346350.474184

This brick, three story warehouse, with a datestone of 1876, is all that remains of the Caldwell distillery, which was established in Newburyport around 1870 and was one of the town's largest industries until passage of the Volstead Act. The distillery itself, which was of wood construction, has been destroyed. The store house is a very attractive structure, and has been extensively renovated by Mr. Leary. The original brick walls of the building are being covered with a veneer of thin bricks, for unknown reasons. A number of the segmental arched windows have been bricked in. The building is 35' x 50'.
(Newburyport Atlas, 1914; SHEC)

CUSTOM HOUSE
21 Water Street
Newburyport

Newburyport East
19.346500.474130

The first Custom House in Newburyport was destroyed in the fire of 1811. This Greek Revival Custom House was built about 1820 and used for office and storage space by various concerns until its purchase by the city of Newburyport. It is a massively built two story structure with a steeply pitched roof, constructed throughout with quarry faced granite blocks, laid in a bond of stretchers without headers. The front door has an elaborate porch the roof of which is supported by thick doric style granite pillars. There are several rows of highly finished granite courses and the granite quoins are also finely finished. The building is 50' x 30'.

(Newburyport Atlas, 1914)

Well Known Industrial Structures No Longer In Existence

McKay Shipyard (location unknown)

Ocean Steam Mills

Newburyport West 19.346060.474160

Peabody Steam Mills

Newburyport East 19.346780.474106

NORTH ANDOVER

Bulk Products Industries

NORTH ANDOVER MILLS

Main Street

North Andover

Lawrence

19.325660.472988

The North Andover Woolen Mills are located on the third mill power site of Cochichewick Brook. At least as early as 1828 a 2 story stone mill, 60' x 35', with a steeply pitched roof, was built next to a dam of unknown height. This woolen mill, built by George Hodges and Edward Pranker, still remains, although in a deteriorated condition. In 1839 Hodges and two new partners, Eben Sutton and Joseph Kittredge, enlarged the embankment, built a new stone dam, and constructed a new brick mill of 4 stories and an attic, 120' x 50', with a picker house and a dye house. This mill was entirely powered by water. In 1899, Moses T. Stevens, took over controlling interest in the mill, and the operation became part of the growing Stevens organization. In 1870 the main mill burned, but the lower 3 stories were salvaged and a 4th story was added, as well as an attic story with a mansard roof. The attic story was removed, probably during the 1920s. During the 1880s a boiler house was added, and the original dye house and picker house were replaced. About 1890 a 4 story addition, 54' x 53', was constructed next to the original mill. During the 1920s an additional mill was constructed, 4 stories, of reinforced concrete and brick. A handsome stone storehouse, dated 1844, is located about 75 meters east

of the main mill. It is 76' x 35' and is constructed of uncoursed granite rubble. It is 2 stories in height, and has a shallow pitch roof.
(FM, No. 5304; HHEC; SHEC)

SCHOLFIELD WOOLEN MILL
172 Sutton Street
North Andover

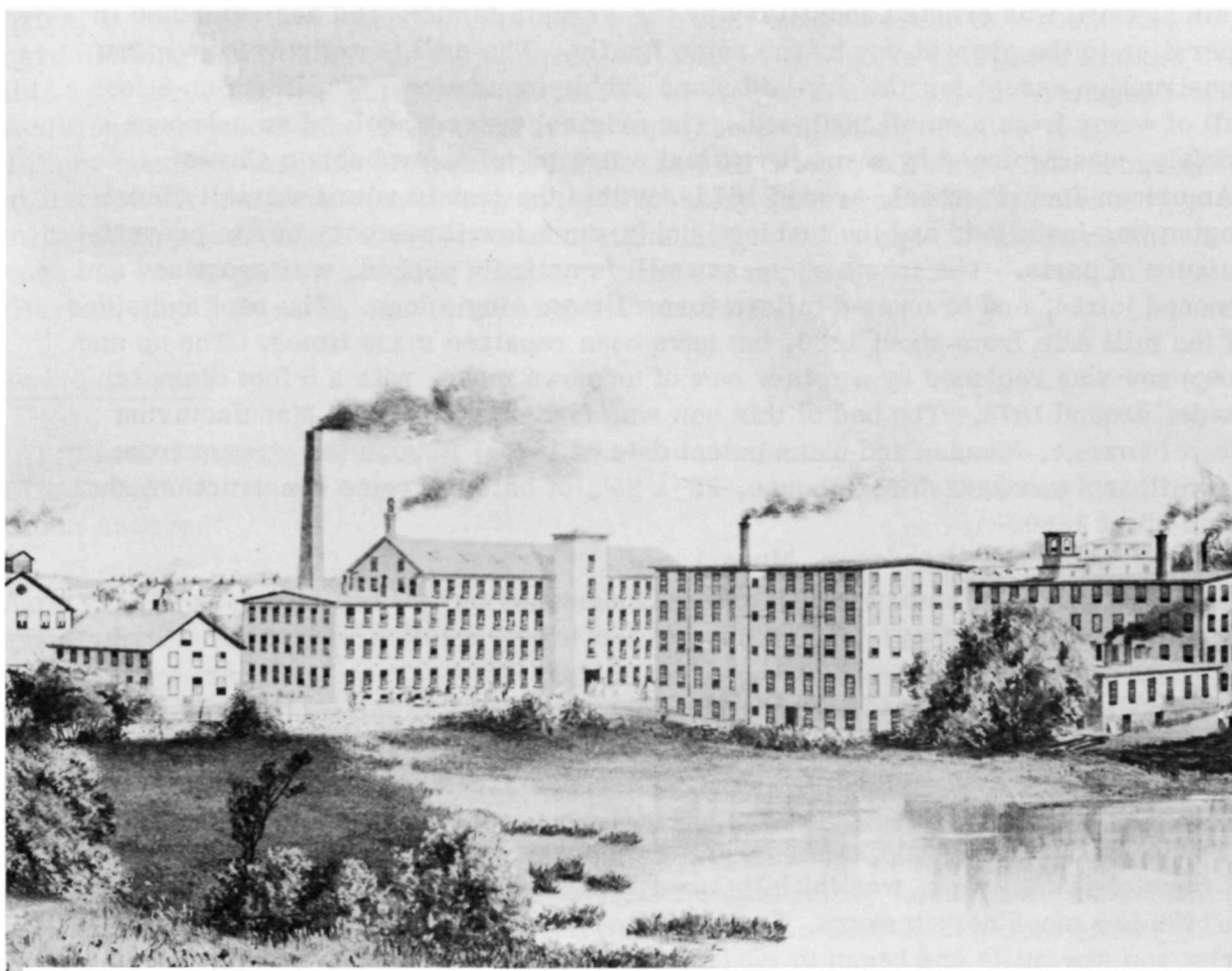
Lawrence
19.325260.473024

This single story frame structure, 40' x 12', was built by James Scholfield, an English woolen machinery maker, in 1802. It was used both as living quarters for Scholfield and his family, and as a spinning and weaving shed. It contained spinning jennies and broadlooms, which were operated by Scholfield and members of his family. The product was woolen broadcloth. All of the machines in the structure were hand powered. Beside this structure and adjacent to Cochichewick Brook, which flows close by, Scholfield erected a single story mill, run by water power, of unknown length and 15 feet width. In this mill there was a woolen carding engine, built by Scholfield, which carded wool for local spinners as well as the Scholfield family. No traces of this mill survive. In 1812 Scholfield sold his machinery to Paschal Abbot of Andover. In 1826 the property was purchased by William Sutton, who erected a number of large woolen mills and constructed a dam upstream of the carding mill. It was probably around this time that the carding mill was abandoned. The spinning-weaving shed is now used as a private dwelling.
(Bagnall)

SUTTON'S MILLS
near Sutton and Main Streets
North Andover

Lawrence
19.325340.473036

In 1826 William Sutton, a leather and wool merchant of Danvers, purchased the fulling and weaving mill on Cochichewick Brook which had been organized by James Scholfield in 1802. The descendants of William Sutton operated the mill until 1958 when it was purchased by the Ames Textile Corporation. During the 1960s the mill went out of operation. It was "renovated" as an industrial park during the 1970s in a generally tasteless fashion, at which time the millpond and headrace were partially filled. The 1826 wooden mill was destroyed after 1930. The 1846 brick mill, 218' x 64', was originally 4 stories high with a pitch roof. In 1899 a fifth story was added. In 1970 all but the first two stories were removed, and the southern side of the building was garishly painted. The boiler house and stack have been removed. The 1924 saw toothed roof weave shed, 106' x 77', has been modified by the replacement of its original windows with those of plate glass. To the north of the main mill alongside the railroad tracks is a brick picker house, 30' x 33', two stories high with a pitch roof, built in 1846 and originally used as a storehouse. Across the railroad tracks from the picker house is another brick two story structure with a pitch roof, built in 1898 as a storehouse. The mill remained generally constant in size after 1850, containing 11 sets of woolen machinery, and manufacturing high quality women's suitings.
(Bagnall; FM, No. 9178; Insurance Survey - MVTM; MSS-MVTM)



Davis and Furber Machine Company, North Andover, Massachusetts, ca. 1880
(MVTM Collections)

FARNUM SAW MILL
End of Farnum Street
North Andover

South Groveland
19.329660.472314

This sawmill was erected about 1750 by the Farnum family, and has remained in operation to the present day by the same family. The mill is entirely of wooden construction except for the dry laid stone rubble foundation. It utilizes an 8 foot fall of water from a small millpond. The original water wheel, of an unknown variety, was replaced by a small vertical water turbine, probably a Chase "American Jonval" wheel, around 1875. Within the last 10 years a small diesel engine was installed, and the turbine is only run a few times per year to prevent seizure of parts. The frame of the sawmill is entirely pegged, with mortised and tenoned joints, and bracketed pillars formed from single logs. The roof and sides of the mill date from about 1880, but have been repaired many times. The up and down saw was replaced by a rotary saw of unknown make, with a 5 foot diameter blade, around 1875. The bed of this saw was made by the Chase Manufacturing Co. of Orange, Mass., and has a patent date of 1872. Across the stream from the sawmill is a sawdust storage house, 25' x 25', of balloon frame construction, dating from about 1880.

(John Farnum, North Andover, Mass.)

Manufacturing Industries

DAVIS AND FURBER MACHINE COMPANY
Elm and Water Streets
North Andover

Lawrence
19.325840.472956

The site of the Davis and Furber Machine Company on the second mill privilege of Cochichewick Brook, was initially used as the location of a saw and grist mill. In 1836 two machinery makers, George Gilbert and Parker Richardson, bought the grist and saw mills and began to manufacture woolen machinery, moving their equipment from their former location at the Marland Mills in Andover. Conditions at the shop were strained until 1848, when George L. Davis and Charles Furber purchased full control of the operation. It was probably at this time that a 4 story frame machine shop was built to replace the grist and saw mill buildings. By 1861 Furber had died and the operation was owned and run by George Davis, John Wiley and Joseph H. Stone. These men and their families ran the operation until well into the 20th century. The company is still in operation as a woolen and synthetic machinery manufacturer, although under different ownership. Davis and Furber was the nation's largest manufacturer of such woolen machinery as dusters, pickers, cards, spinning mules, and finishing machinery and still retains a large share of the market for woolen machinery. None of the original buildings remain, but many of those structures erected since 1861 are still in use. Most prominent of these buildings is the 1861 machine shop on Elm Street with its 1863 addition, which was used as a forge shop. The machine shop is a 4 story brick pitch roof structure, with skylights and 2 stair and water towers. The shop is 156' x 50'. The addition, 62' x 52', is a brick structure of 3 stories and a shallow pitch roof.

The wheel house at the east side of the machine shop was probably built in 1861. In 1881 another building was joined to the machine shop, 3 stories, 160'x50'. During this period a wooden foundry building, flask shed, and pattern shop were also built. These buildings were replaced by a new foundry in 1917. In 1887 a brick, 3 story shallow pitch roof building was constructed in order to manufacture card clothing and to serve as the company offices. A handsome bell tower makes this 1887 structure one of the most attractive of the Davis and Furber buildings. Additions continued to be made until 1920, when the completion of a 240' x 90' 4 story concrete machine shop marked the end of all further building. The company utilized water and steam power to run its machinery until around 1960, when it switched to power supplied by Massachusetts Electric Company. Its three steam engines, seven boilers and four generators remain in place.
(Barlow, No. 3436; FM, No. 9174; MSS-MVTM; SHEC)

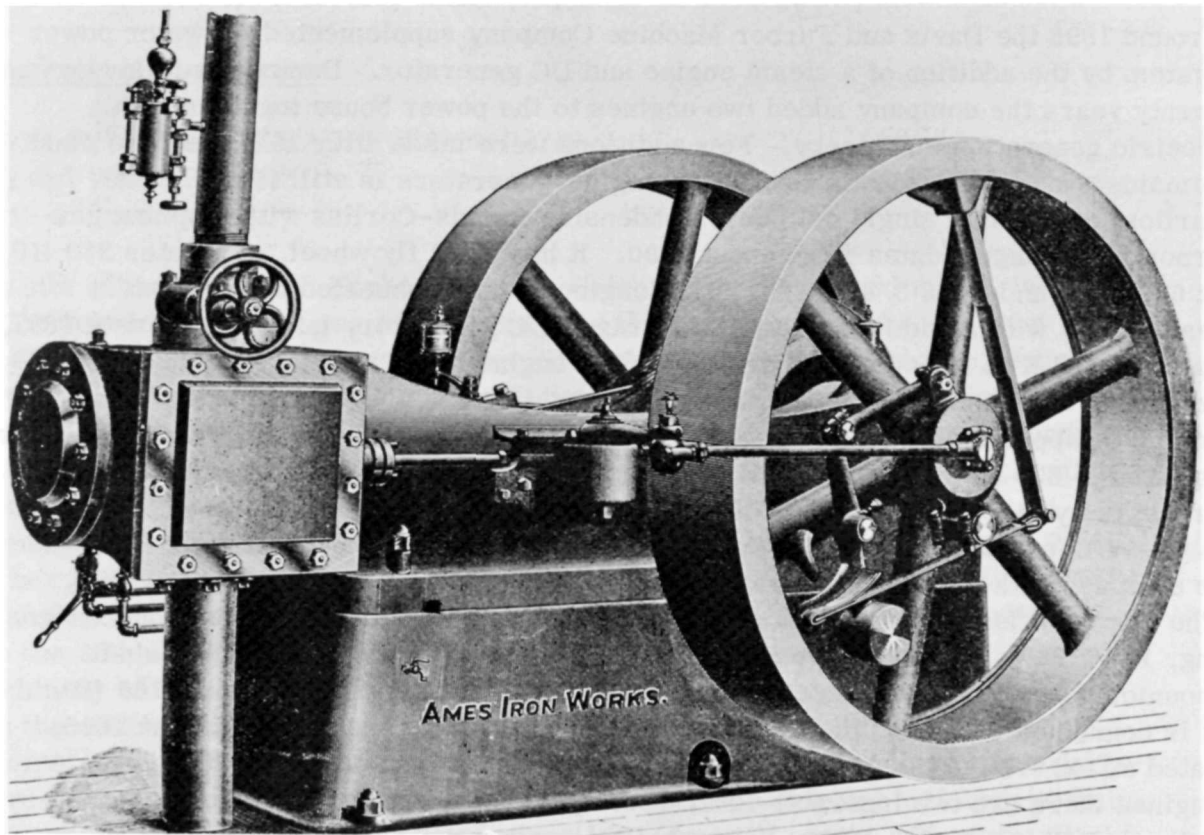
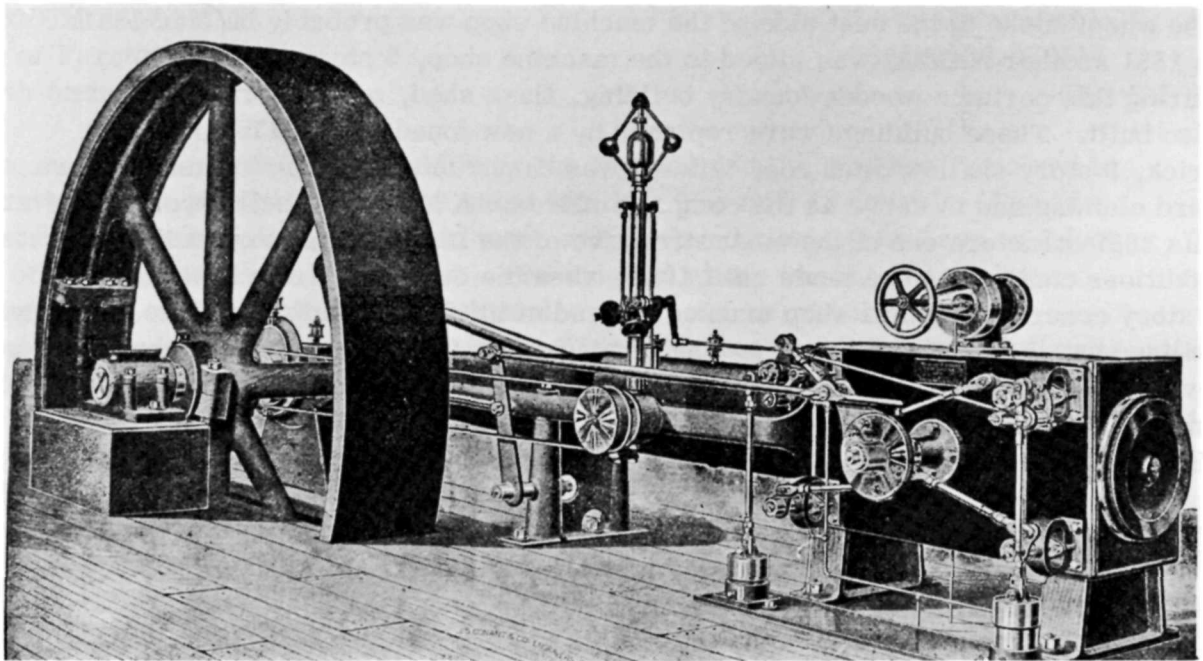
Power Sources

DAVIS AND FURBER POWER HOUSE
Elm Street
North Andover

Lawrence
19.325840.472956

Around 1895 the Davis and Furber Machine Company supplemented its water power system by the addition of a steam engine and DC generator. During the following twenty years the company added two engines to the power house together with electric generation machinery. Few additions were made after 1915, and the plant remains practically intact. One of the engine/generators is still in use. The earliest engine is a single cylinder, condensing Harris-Corliss with a spring governor. The engine dates from about 1890. It has a 22' fly wheel, generates 260 HP at 63 RPM, and is 23 3/8" x 48". This engine is still connected by means of a leather belt with a width of 3 feet to a Sprague DC generator, latest patent date 1897, rated at 260 KW. Beside the Harris-Corliss engine is a Rice and Sargent cross compound double expansion engine without a holding chamber. It is a condensing engine equipped with a Porter governor. The latest patent date is 1895. This engine is rated at 600 HP at 102 RPM. It has a single flywheel of 16' diameter. The high pressure cylinder is 18" x 42", and the low pressure cylinder is 36" x 42". The engine was purchased from the Pacific Mills in Lawrence and installed in 1915. It is equipped with 2 Sprague generators, latest patent date 1897, rated at 350 KW. The third and last engine in the power house is an Ames single cylinder non-condensing, 18" x 16" engine with two 5 foot flywheels, one of which contains the shaft mounted governor. The power flywheel rotates at 200 RPM and delivers 160 HP. It is connected by means of a leather belt to a Sprague DC generator, about 1895, rated at 150 KW. This engine and generator are still in use. In addition to the engines there are two Ingersoll-Rand air compressors, about 1895, with 6 foot pulleys, 14" x 12", 200 RPM. In the boiler house are 6 Dillon HRT boilers dating from 1916 to 1937, and one Bigelow HRT dating from about 1920. The control board for the generators is equipped with Weston meters dated 1890. Both water turbines were removed in 1947.

(Davis and Furber Plant Engineer)



Two types of steam engines located in Davis and Furber Machine Company Powerhouse, North Andover, Massachusetts.

Top: Harris-Corliss. Bottom: Ames Slide Valve.

(Cyclopedia of Engineering)

Specialized Structures

STOREHOUSE

near intersection of Main and Sutton Streets
North Andover

Lawrence

19.325320.473020

The origin of this two story stone building is unknown. Its design is that of a storehouse, and it is most likely that the structure was used as a freight depot by the Boston and Maine Railroad during the 1840s. By 1875 it was in use as a storehouse of the Sutton Woolen Mills. It is unoccupied today. The building is 36' x 32', constructed of uncoursed granite rubble, with quoins of granite blocks. It has windows only on its west side, together with loading doors. It has a pitch roof. (FM; Essex County Atlas, 1875)

NORTH BILLERICA

Bulk Products Industries

FAULKNER WOOLEN MILLS

Elm Street and Concord River
North Billerica

Billerica

19.312520.471788

The original mill buildings of the Faulkner Woolen Company were erected on this site in 1811, but none remain. The oldest building on the site is a single story brick storehouse, 20' x 35', similar to those built at Lowell and Lawrence in the 1830s and 1840s. The main mill is 3 stories high, brick, with an attractive stair and water cistern tower at the northeast corner of the building, an unusual location for a tower. This structure, built in 1880, remains intact, although it has received additions dating from the early and mid-twentieth century. The boiler house and chimney probably date from about the 1880s. In 1920 the plant contained 8 sets of cards and 50 broadlooms. This capacity has remained unchanged to the present day. (HHMC; Lowell Today; Stone)

TALBOT MILLS

Elm Street and Concord River
North Billerica

Billerica

19.312480.471775

The Talbot Mills were erected in 1857 by Charles and Thomas Talbot, under the management of Charles Stott, who founded and ran the Belvidere Woolen Co. of Lowell. In 1862 the Talbots took over full control of operations and the family continued to operate the mill, which produced flannels and cassimeres, and later chev-iots and military olive drabs. The mills were originally powered solely by water, but the company's manufacturing facilities were doubled in 1880, and it was probably at this time that the 60' x 60' boiler-engine house was built. In 1857 the company possessed 8 sets of cards and 50 looms; in 1890 the figures had risen to 20 sets and 178 looms. During the 1920s, at its peak, the mill contained 20 sets of cards and 228 looms, employing 450 workers. This made the Talbot Mills one of the nation's largest woolen companies, exclusive of companies which operated more than a single



Talbot Mills, North Billerica, Massachusetts, ca. 1875. In foreground is the Middlesex Canal Company Dam (1828).
(Lowell Today)

mill. The company was one of the last to own large numbers of worker housing units, renting about 150 units at low rates to its workers. During the 1960s the Company suspended operations and has been tenanted ever since. Few of the mill buildings have been destroyed, and the buildings appear very similar to their 1922 condition. The 1857 mill, brick, 210' x 50', remains although a fifth story was added about 1880 and a shallow pitch roof replaced the original steeply pitched roof. An ell was constructed directly to the west of the original mill around 1870, originally four stories in height, 200' x 50'. It, too, received an additional story around 1880. Another extension on the north corner of the 1857 mill was built around 1880, and remains intact. The office building facing on Elm Street dates from the years 1910-1922, although it has been styled in a manner similar to the 1857 mill. The remaining buildings were built during the years 1880-1920, with the exception of the 2 story brick storehouse which faces the original mill on the east side of Elm Street. The structure probably was also erected in 1857. (FM, No. 5673; HHMC; Lowell Today; Stone)

Transportation

Middlesex Canal Dam and Locks
Faulkner Street and Concord River
North Billerica

Billerica
19.312580.471780

The Middlesex Canal was built during the years 1793-1803 under the direction of Loammi Baldwin, Sr., with the English engineer William Weston acting as a consultant during the early years of construction. The canal ran from what is now Lowell, through Chelmsford, Billerica, and Woburn to Charlestown, a distance of over 27 miles. The canal operated until 1853, when competition from the railroads forced its closure. Its original 20 locks, 8 aqueducts and 48 bridges have been almost totally destroyed, and the canal bed itself has been filled or else is badly deteriorated. The major structures which survive are the Shawsheen Aqueduct in Billerica, the rebuilt (1937) Maple Meadow Aqueduct in Wilmington, and a fragment of the locks and dam at North Billerica. The Concord River was the canal's major source of water, being located at the highest point in the Canal's course, 107 feet above the tide water at Charlestown and 25 feet above the Merrimack River. The secondary source of water for the canal was at Horn Pond in Woburn. The dam across the Concord River originally used by the Middlesex Canal Company was of wood construction and probably replaced a 1708 wooden dam. In 1828 the Company built the masonry dam which is still in place, and which was purchased from the Canal Company in 1857 by the owners of the Talbot and Faulkner Woolen Mills in North Billerica, who used the water to run their water wheels and turbines. Near the head-race of the Talbot Mill yard is part of the lock which allowed barges to pass from the west side of the Concord to the continuation of the Canal on the River's east bank. A floating towpath, now removed, allowed the barges to be hauled across the Concord River millpond.

(Mary S. Clarke, Guide to the Middlesex Canal 1793-1853 (Middlesex Canal Association); Meader; Christopher Roberts, The Middlesex Canal, 1793-1860 (Cambridge, Mass, 1938).)

NORTH CHELMSFORD

Bulk Products Industries

UNITED STATES WORSTED COMPANY (Silesia Woolen Mills) Nashua South
Middlesex Avenue near Stony Brook 19.304960.472310
North Chelmsford

The Silesia Woolen Mills of the United States Worsted Company was established in 1912 in standard mill construction brick buildings. Other mills of the company were located in Lawrence and Saugus. The original product was worsted yarn, but 100 broadlooms were introduced in 1920. The mill contained 36 cards, 40 (french) combs, and 35,000 spindles, employing between 1,200 and 1,400 workers. The U. S. Worsted Co. suspended operations during the 1930s and the buildings of the Silesia Woolen Company were occupied by the Southwell Wool Combing Company and several warehousemen.

(Davison's Blue Book, 1912-1934)

GEORGE C. MOORE COMPANY Nashua South
71 Princeton Street 19.304820.472286
North Chelmsford

George C. Moore began his wool scouring business in 1872 near the site of an iron foundry, using water from the North Chelmsford Canal. In 1930 the buildings were purchased by the Gilet Wool Scouring Company, formerly located in the Middlesex Woolen Mills in Lowell. The Gilet family still runs the concern. The brick two and three story buildings date from the years 1908-1925. The wooden two and three story structures on this site were constructed during the 1860s by the Baldwin Woolen Company. A wooden machine shop with a pitch roof, 45' x 15', parallel to Stony Brook, may have belonged to the iron foundry, and probably dates from about 1850.

(Barlow; FM; Stone)

SOUTHWELL WOOL COMBING COMPANY Nashua South
70 Princeton Street 19.304880.472300
North Chelmsford

James Southwell organized the company bearing his name in 1922, erecting the existing two, three and four story brick buildings in the same year, as well as occupying a few of the buildings of the Chelmsford Foundry Company. The firm continues in existence.

(Stone)

Manufacturing Industries

CHELMSFORD FOUNDRY COMPANY
70 Princeton Street
North Chelmsford

Nashua South
19.304960.472300

This carpenter-machine-blacksmith shop was built in 1888-1890 by the Chelmsford Foundry Company, which began operations in 1858, and which specialized in the production of cast and wrought iron pieces for the construction of buildings and bridges. The shop was intended to finish and partially fit the castings. The building is 165' x 44', two stories, with an addition on the southeast side that is 65' x 44'. The building is of brick construction, with the floor beams anchored to the outside walls. During the 1930s the building was purchased by the Southwell Wool Combing Company.

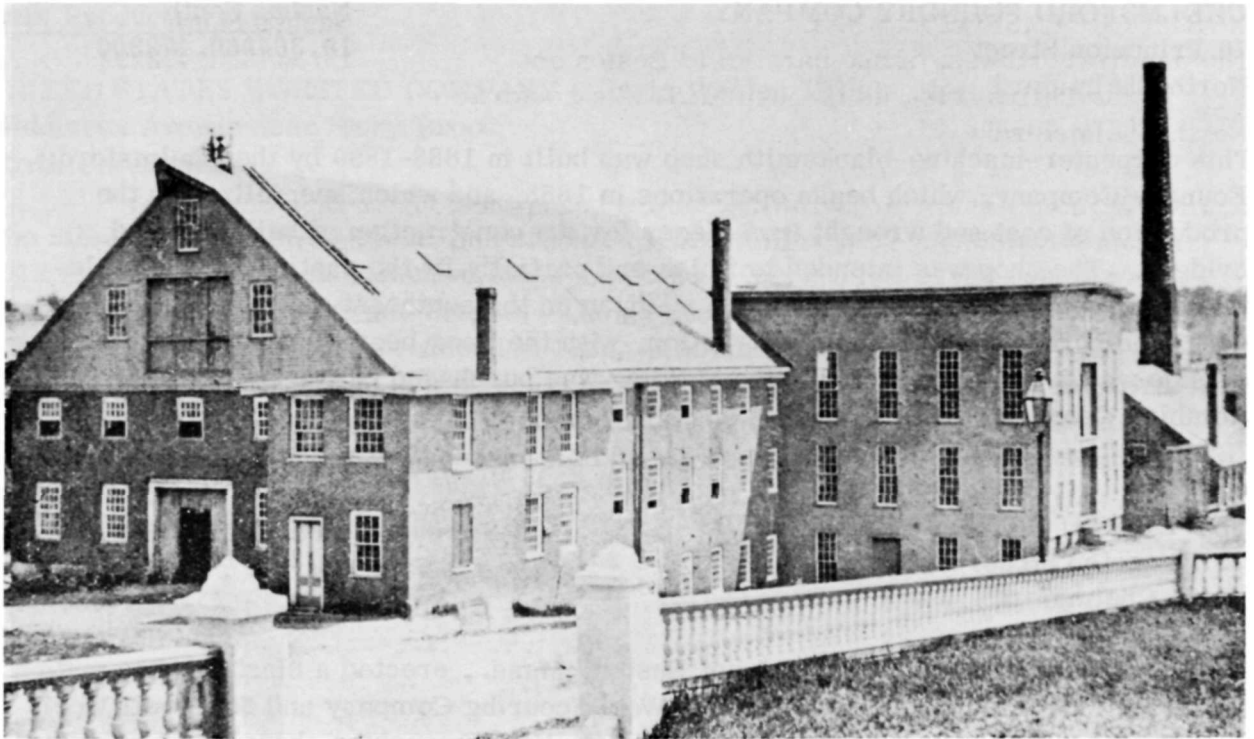
(Barlow, No. 9322; HHMC)

SILVER AND GAY'S MACHINE SHOPS
70 Princeton Street
North Chelmsford

Nashua South
19.304910.472294

About 1825 General Shepard Leech, of Easton, Mass., erected a blast furnace and foundry on the sites of the present Gilet Wool Scouring Company and Southwell Wool Combing Company. In 1834 Ira Gay of Nashua, New Hampshire, bought one-quarter of a machine shop which had been built around 1830 by General Leech. In 1838 Ira's brother Ziba purchased an additional one-quarter. In 1842 another one-quarter was purchased by Harvey Silver. In 1849 Silver purchased the remaining one-quarter, and the operation was known as the Gay and Silver Company until 1890, when the shops were purchased by George Moore, who operated a wool scouring company nearby. As the North Chelmsford Machine Company, the shops burned in 1901, but were rebuilt. In 1905 the buildings were used as machine shops and storage facilities for the North Chelmsford Machine and Supply Company, and remained so until the 1930s, when the properties were purchased by the Southwell Wool Combing Co. The buildings have been tenanted ever since. Despite the fire, the first floor of the 1830 shop has survived, with a new second story and without the original attic. Four other buildings dating from the years 1850-1870 are also intact, although practically unrecognizable from the addition of other buildings and the use of tar paper and siding to cover the original wooden walls. The boiler house, dating from about 1860, has survived the best, but its original pitch roof has been removed and flattened. The chimney is also gone. Silver and Gay were perhaps the premier machine shop of the United States during the years 1840-1870. Although small by comparison with the shops in other parts of the country, the firm made machine tools, water turbines, and textile machinery of a very high quality and originality.

(Barlow, No. 4449; HHMC; Lowell Today; Warren G. Ogden, North Andover, Mass.; Stone)



Silver and Gay's Machine Shop, North Chelmsford, Massachusetts, ca. 1880
(Lowell Today)

Bridges

STONE ARCH RAILROAD BRIDGE
crosses Stony Brook at its intersection with
Merrimack River
North Chelmsford

Nashua South/Mass.
19.305220.472316

This twin arch granite railroad bridge was built around 1838 as part of the Nashua and Lowell Railroad. It has two segmental arches, each with a span of 12 feet and a rise of 5 feet. The total length of the bridge is 45 feet and its width is 20 feet. One set of tracks cross the bridge. Construction is of quarry faced granite blocks and granite rubble, uncoursed. These blocks were probably originally laid without mortar, but the joints have been pointed with large amounts of mortar in recent years.

Specialized Structures

NORTH CHELMSFORD CANAL

Nashua South

100 meters northwest of and parallel to Boston and

19.304820.472292

Maine Railroad tracks through North Chelmsford

North Chelmsford

In 1823 William Adams of North Chelmsford began the construction of a power canal from Newfield Pond, parallel to Stony Brook, and running for approximately 2,500 feet. The purpose of the canal was to supply water power for an iron foundry to be built by General Shepard Leech of Easton, who was already operating a foundry in Easton and Boston. Leech supplied the Lowell Machine Shop with all its castings until the construction of a foundry in Lowell in 1840. It was first necessary to raise the level of Newfield Pond by about twenty feet. To do this, Adams dug a feeder canal from Stony Brook in West Chelmsford to the southern tip of Newfield Pond. The pond's banks were also raised and reinforced in many areas. Having raised the level of the pond, the power canal itself was built by the end of 1823. Water from the canal dropped about 25 feet through the wheels of the foundry and into Stony Brook. As part of the construction of a new mill in the 1920s, the canal was shortened 400 feet so that it now ends at Princeton Street. In 1970 part of the Newfield Pond embankment ruptured and the pond sank to its 1822 level. The canal is thus empty except for its easternmost 400 feet, which have been walled off by the Gilet Wool Scouring Company and used as a storage area for process water. The company pumps the water from Stony Brook into the canal. The gate house of the Canal has been removed, although the stone foundation of the house is intact. Most of the granite blocks which were used to keep the banks in place are gone, but a few remain. The canal appears to have been dug without any attempt to create a rectangular section. The shape can best be described as concave. The canal is fairly straight, however, and when curves are necessary they are gradual. The canal is 15 to 25 feet in width and 8 to 10 feet deep. Plans are underway to repair the Newfield Pond embankment, refill the pond, and place the canal back into operation as a supplier of feed and process water.

(COR; HHMC)

ROCKS VILLAGE

Bridges

ROCKS VILLAGE BRIDGE

Haverhill

Main Street and Merrimack River

19.336440.474150

Rocks Village

The first bridge across the Merrimack River at Rocks Village was built in 1795 and was washed away by a freshet in 1817. A new bridge consisting of four Burr truss wooden spans and a draw was completed in 1828. In 1873 one of the central spans as well as the draw were replaced by a double intersection riveted Warren

truss swing span on a turntable, with a length of 160 feet. The draw section was replaced by a riveted parallel chord Pratt truss span of 75 feet, without an upper lateral system. In 1893 the wooden span on the Rocks Village side of the River was replaced by a riveted, Pennsylvania Petit truss span of 185 feet. The span was installed by the Boston Bridge Works. In 1914 the two wooden spans on the West Newbury side of the River were replaced by a parallel chord riveted Pratt truss span of 125 feet, with no upper lateral system, a Pennsylvania Petit truss span of 200 feet, and a Pratt truss span of 100 feet, without an upper lateral system. The five rectangular granite piers date from 1873 to 1914. The turntable rests on a round granite pier about 20 feet in diameter. The abutments date from 1828. The swing span of this bridge is still in operation. (Whittier Collection, Haverhill Public Library, Haverhill, MA)

ROWLEY

Bulk Products Industries

GLEN MILLS GRIST MILL (Jewel Mill)
Glen Street and Route 1
Rowley

Georgetown
19.344500.473348

This is one of the oldest mill sites in the United States. The earliest known fulling mill in North America was erected here in 1643. It was in use as a fulling mill until 1820 when the buildings were converted to a wool carding factory. The owner of the carding mill, Nathaniel Dummer, also manufactured snuff. In 1856 Dummer converted the buildings to a grist mill, and they remained so until the destruction of the mill by fire in 1914. In 1940 a much smaller mill, powered by a water wheel and turbine, was built on the site of the destroyed building, and used by a Mr. Smith for the crushing and polishing of stones to be used in the making of jewelry. This company continues in operation. Of the grist mill buildings, only a wood storehouse and a wood wagon house remain. They both probably date from about 1850. The reconstructed mill is one and one-half stories high, with a 12 foot Fitz water wheel, about 1920, and a small (18") horizontal water turbine of unknown maker or date. The dam is about 100 feet west of the mill and is about 8 feet in length. It is built of small stones in a rip-rap style, with a concrete crest (1940). The headrace and penstock were also extensively modified in 1940. A foot-bridge on the mill site, 4 feet wide and 25 feet long, with a queenrod truss, was built in 1940.

Bridges

GLEN MILLS STONE BRIDGE
spur road connecting Glen Street and Route 1
Rowley

Georgetown
19.344520.473344

This stone arch bridge was probably built around 1850 across the Mill River near the Glen Mills carding-grist mills. The arch stones are cut granite blocks set

without mortar. The span of the segmental arch is 15 feet, with a rise of 6 feet. The rest of the bridge is constructed of uncoursed stone rubble. The total span is 30 feet, and the width is 20 feet.

TYNGSBOROUGH

Bridges

TYNGSBOROUGH BRIDGE

connects Middlesex Road and Pawtucket Boulevard
Tyngsborough

Nashua South
19.301600.472746

This bridge, constructed by the Boston Bridge Works in 1930, is a steel ribbed arch highway bridge across the Merrimack River about equidistant between Lowell and Nashua. It has twin parabolic arch ribs, Pratt stiffening trusses, and I-beam vertical hangers pinned to the ribs and the lower chord. The pier abutments are of reinforced concrete. The span of the arch is 500 feet, and the width of the bridge is 30 feet. The height of the ribs is 60 feet, exclusive of the stiffening trusses. The deck of the bridge is 30 feet above the mean water level.
(Mass. DPW)

WEST CHELMSFORD

Extractive Industries

FLETCHER GRANITE COMPANY
Groton Road (Route 40)
West Chelmsford

Nashua South
19.301720.472262

In 1880 H. E. Fletcher opened the ledge of granite in Oak Hill which is still being worked by the company which he organized. Granite had been quarried on Oak Hill since at least 1826, but the Fletcher Company was the first organization to quarry on a very large scale. Today the ledge has sunk to a depth of 300 feet, and this pit is almost 800 feet in width. A railroad track runs the perimeter of the pit and carries the granite blocks to the company's storage lots. A large steel derrick is used to transport large blocks and several creeper cranes are used for the smaller blocks. A ten wheel circular wire saw is used to saw sections of the ledge. All of the present buildings are modern, and are of wood framed with corrugated metal sheathing. The quarry is the largest in the United States, employing about 200 men.

(H. E. Fletcher, "The Granite of Middlesex," Contributions of the Lowell Historical Society, vol. II, no. 2, 1925; HHMC; Robert O'Brien, Director of Public Relations, Fletcher Granite Co., ; Stone)



Stone Railroad Bridge, Westford, Massachusetts
(Photo by author, 1975)

WESTFORD

Extractive Industries

PALMER GRANITE QUARRY
Snake Meadow Hill
Westford

Westford
19.297130.471910

Although granite had been quarried in limited quantities from Oak Hill (Westford) since 1826, the granite quarry of Benjamin Palmer, organized in 1845, was the first major operation in the area. Palmer was able to ship his granite on a spur line of the Nashua, Acton and Boston Railroad, and his granite was widely used throughout the mill towns and cities of Massachusetts, as well as New York, Chicago, and New Orleans. Another quarry next to that of Palmer was begun around 1846 by Samuel Fletcher, who sold large quantities to the Essex Company of Lawrence for the construction of their dam and canal. The granite from the quarry was not adapted to fine cutting, but was very suitable for construction work in industrial structures. The quarry was deserted after World War II. None of the machinery used in cutting and removing the stone remains.

(HHMC)

Bridges

STONE RAILROAD BRIDGE
1,200 feet southeast of intersection of
West and Prescott Streets
Westford

Westford
19.297120.471786

This is the finest stone arch bridge in the Lowell area. The bridge was built around 1848 as part of the Nashua, Acton and Boston Railroad. It connected the quarries of Westford with Lowell and Nashua. Construction was begun on the spur line in 1847, and it was completed by 1848. The rails have since been removed, but the grade itself is in excellent condition. The bridge was built to span Stony Brook, about equidistant between Forge Village and Graniteville. It is a single semi-circular arch, with a span of 40 feet and a rise of 20 feet. The total span is 60 feet and the width is 20 feet. The bridge is constructed of random coursed quarry faced granite blocks of varied dimensions, but averaging 4'x 2' x 2'. The bridge was constructed without the use of mortar. The massive wing abutments and the unusual height of the arch in such a beautiful setting makes the bridge the most impressive stone arch structure in the lower Merrimack Valley.

(HHMC)

EXISTING SURVEYS		DATA		DWGS		PHOTOGRAPHS		STATES																												
<h1>HAER INVENTORY</h1>																																				
1. NAME OF STRUCTURE Tower Hill High Pressure Stand Pipe				2. DATE 1896		3. NATURE OF STRUCTURE Reservoir		4. INDUSTRIAL CLASSIFICATION 310																												
5. LOCATION: STREET & NUMBER near intersection of Hillside Ave. & Yale St.				CITY OR TOWN Lawrence		COUNTY Essex		STATE MA																												
7. OWNER OF PROPERTY City of Lawrence				ADDRESS Lawrence, MA 01840		6. USGS QUAD MAP & UTM GRID REF. 19.321000.473048																														
8. CONDITION: <input checked="" type="checkbox"/> EXCELLENT <input type="checkbox"/> GOOD <input type="checkbox"/> FAIR <input type="checkbox"/> DETERIORATED <input type="checkbox"/> RUINS <input type="checkbox"/> UNEXPOSED <input type="checkbox"/> ALTERED <input checked="" type="checkbox"/> ACCESSIBLE TO PUBLIC																																				
9. DESCRIPTION & BACKGROUND HISTORY: NUMBER OF STRUCTURES; DIMENSIONS; FABRIC; STRUCTURE & FORM; SURVIVING MACHINERY, FITTINGS AND EQUIPMENT; APPROX. AREA OF SITE; ALTERATIONS; PRESENT USE; ENGINEER ARCHITECT DESIGNER; IMPORTANT EVENTS & INDIVIDUALS. The Lawrence high pressure stand pipe was constructed in 1896 to supply water to areas in the neighborhood of the reservoir as well as the business and mill district of Lawrence, which required high pressure water for fire prevention purposes. The stand pipe itself is steel, 102 feet high and 30 feet in diameter, with a capacity of 528,768 gallons. It has an 8 inch overflow pipe which conducts excess water back to the reservoir. The tank is enclosed by an octagonal tower which is 157 feet in height from the foundation to the top of its octagonal turret roof. The lower 27 feet of the tower consists of random coursed granite blocks, and the remainder is of brick. Above the level of the stand pipe there is a balcony, which is covered by the chateau style roof sheathed in copper. Beside the octagonal tower is a round stair tower which is slightly shorter than the main structure. This stair tower has a round chateau style turreted roof. Narrow windows with semi circular arches are placed at intervals throughout the height of both the octagonal and round towers. The stand pipe was designed and constructed by Arthur D. Marble, the city engineer. Marble also constructed the tower. George G. Adams of Lawrence was the architect of the tower. Albert F. Noyes																																				
10. PHOTOGRAPHS & SKETCH MAP ON REVERSE SIDE was consulting engineer.																																				
11. RELATED SOURCES OF INFORMATION: HISTORICAL REFERENCES (PUBLISHED ARTICLES, MANUSCRIPTS, REPORTS, DRAWINGS, PHOTOGRAPHIC RECORDS) CONTACTS (NAMES & ADDRESSES OF ANYONE WITH EYE-WITNESS ACCOUNTS OR RELEVANT INFORMATION); TAPE RECORDINGS. Maurice B. Dorgan, History of Lawrence, Massachusetts (Cambridge, Mass., 1924) The Engineering Record, vol. 39, No. 17, 25 March 1899, pp. 376-7.																																				
12. DANGER OF DEMOLITION OR DAMAGE <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO NATURE OF THREAT:								13. PRIORITY 3																												
14. EXISTING SURVEYS <input type="checkbox"/> NHL <input type="checkbox"/> NR <input type="checkbox"/> HAER <input type="checkbox"/> HABS <input type="checkbox"/> STATE <input type="checkbox"/> COUNTY <input type="checkbox"/> LOCAL <input type="checkbox"/> OTHER																																				
15. INVENTORIED BY: YOUR NAME ADDRESS AFFILIATION DATE Peter M. Molloy 800 Mass. Ave., North Andover, MA 01845 Merrimack Valley Textile Museum 11/1/75																																				
PLEASE RETURN TO THE HISTORIC AMERICAN ENGINEERING RECORD, NATIONAL PARK SERVICE, WASHINGTON, DC 20240																																				
MANUFACTURING INDUSTRIES (MFG)			UTILITIES (UTIL)		POWER SOURCES & PRIME MOVERS (PS & PM)			TRANSPORTATION (TRANS)		COMM		BRIDGES																								
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